

THE CONSTRUCTION
INDUSTRY IN OHIO
♦ ♦ RALPH J. WATKINS ♦ ♦

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THE CONSTRUCTION INDUSTRY IN OHIO

A Statistical Analysis of a Seasonal Industry

by

RALPH J. WATKINS

BUREAU OF BUSINESS RESEARCH
COLLEGE OF COMMERCE AND JOURNALISM
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PREFACE

The Bureau's study of the construction industry in Ohio was undertaken at the request of the Executive Committee of the Ohio State Association of Builders' Exchanges. The chief problem involved in the study is the seasonality of operations in the various building trades. The report contains complete information in regard to the extent of the seasonality at the present time and also in preceding years. While there has been some increase recently in winter construction much is yet to be accomplished, both from the standpoint of the profitable operation of particular firms, and also from the standpoint of the workers.

This study also indicates the importance of the building industry in comparison with other leading industries of the State. When the size of the industry and its seasonality are both considered, it becomes clear that the solution of the problems of regularization of employment in this industry would be of great significance from the standpoint of regular employment in industry as a whole.

Data and charts are also presented showing the extent of the interruption of building operations by reason of weather conditions prevailing in various parts of the State. Planning charts are also presented for the purpose of suggesting to the builders a procedure in the use of employment and weather statistics in planning construction operations.

The Bureau wishes to express its indebtedness to Mr. Philip P. Gott, Secretary-Treasurer of the Ohio State Association of Builders' Exchanges, for his co-operation and assistance in connection with the preparation of this report. The author also wishes to express his obligations to Mr. H. G. Brunsman for his careful work in supervising the calculations and preparing the charts.

Spurgeon Bell, Director.

May, 1926

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THE CONSTRUCTION INDUSTRY IN OHIO

CHAPTER I

THE IMPORTANCE OF THE CONSTRUCTION INDUSTRY

In the Nation

The construction industry ranks among the major economic groups in the United States. The industry is founded on an elemental human requirement—housing—and this fundamental position seems to characterize the general relation of the industry to the economic structure of the country. It is not only an important industry in its own right, but also occupies a very significant position because of the relation of construction to other basic industries, and, hence, to general business conditions.

Rank Among Leading Industries

The absolute importance of the construction industry can be shown readily by a few facts. It has recently been estimated by the National Bureau of Economic Research that from eight to twelve per cent of the national income is spent on construction. Approximately two and one-half million workers were listed in the census of 1920 under the construction trades. The number of workers engaged in other lines of activity which are directly related to the construction industry, such as saw mills, wood working establishments, cement plants, steel works and rolling mills, brick and tile plants, stone quarries, paint and hardware manufacturing, etc., is very great. The volume of construction contracts awarded in 1925 in 36 Eastern States, as recorded by the F. W. Dodge Corporation, amounted to over 5.8 billion dollars. The same authority estimates that the total value of all construction in the United States in 1925 exceeded 6.6 billion dollars. As a somewhat comparable figure, the wholesale value of motor vehicles manufactured in the United States in 1923 was slightly less than 3.2 billion dollars, according to the 1923 United States Census of Manufacturers.

Economic Interrelations of the Industry

The unique position of the construction industry, however, is not due to its own immediate importance, but to the far-reaching influence which building has on general business conditions. The industry has been termed "the balance wheel of American busi-

ness." The logic back of this term is readily understood on consideration of the different industries which are dependent on the building industry. Activity in the building industry constitutes the demand for a host of industries. The executives of the steel industry follow closely the developments in building because of its bearing on their sales; the same thing can be said of the other industries enumerated in the above paragraph. Even the furniture magazines devote considerable space at the beginning of each year to probable developments in building.

In Ohio

This important place of the building industry seems to be recognized universally. Both the industry and the public have accepted the designation, "the balance wheel of American business." This present study is not concerned primarily with this phase of the industry, but with the seasonality of operations which characterizes construction. This seasonal problem is, however, related to this discussion of the significance of the building industry. A balance wheel, to function properly, should be regular in its movements and should oscillate about a center. It is pointed out in this report, as a result of the complete analysis of the records, that in the State of Ohio the construction industry is decidedly off center in its seasonal operations, and, further, that this seasonality is not necessary under the circumstances, but is the carry-over of the customs and technique of an earlier period.

Volume of Building in Ohio—Relative Position

The construction contracts awarded in Ohio in 1925, as reported by the F. W. Dodge Corporation, were valued at 451 million dollars, and this figure was exceeded by only three states, New York, Illinois and Pennsylvania. The State thus holds its population rank in building activity. Within the State the building industry in 1923¹ ranked third among the leading groups of industries, measured by the total wage and salary payments reported to the Ohio Industrial Commission. Among individual industries in the State, the general contracting group ranks seventh. The relative standing of the building industry in Ohio is shown graphically in Charts I and II.

¹The latest year for which the data are available. These reports are made by all employers of five or more persons and cover all industries except interstate railroads.

CHART I

TEN LEADING GROUPS OF INDUSTRIES IN OHIO
MEASURED BY THE TOTAL WAGE AND SALARY PAYMENTS
1923

Source: Division of Labor Statistics, State of Ohio

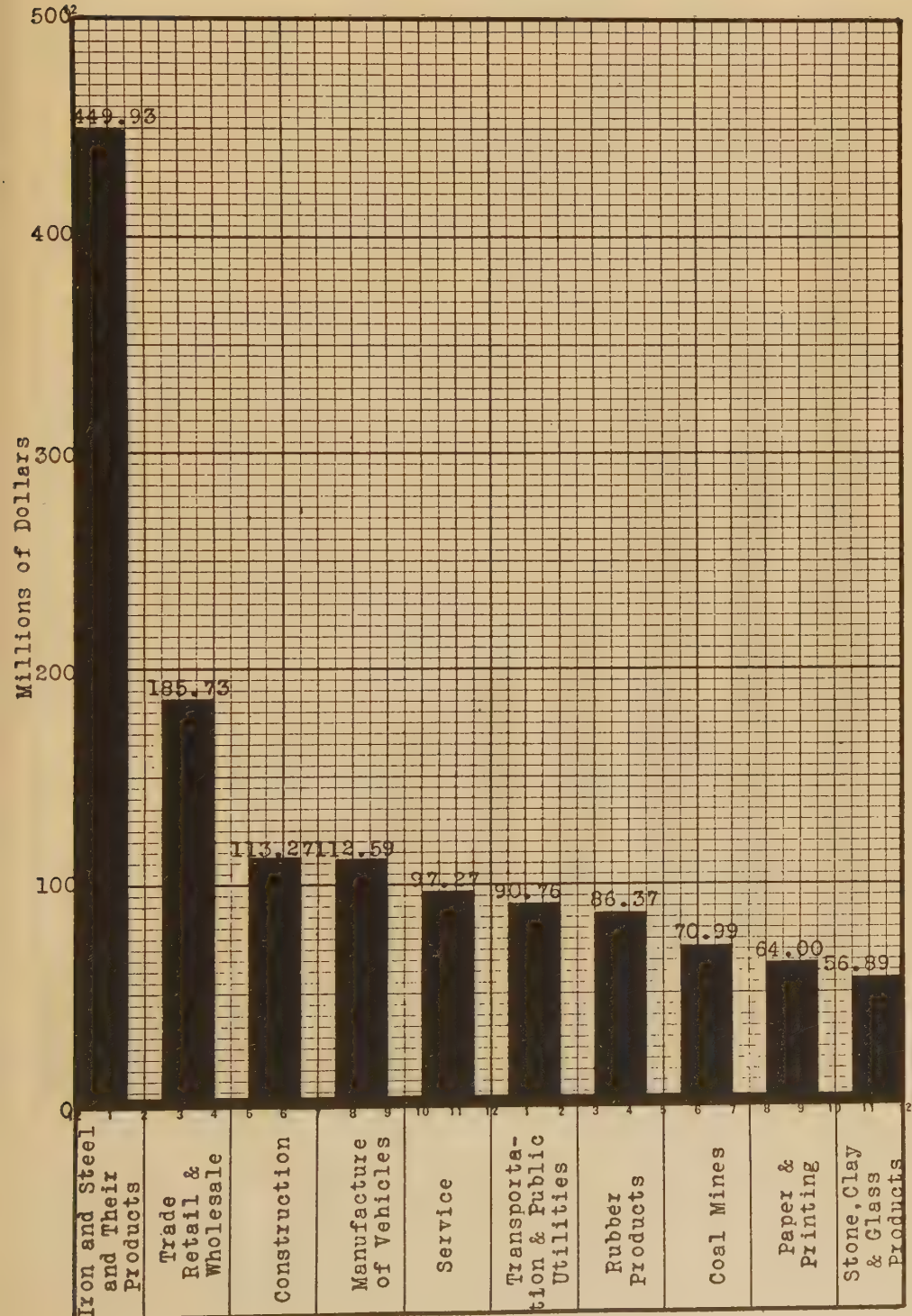
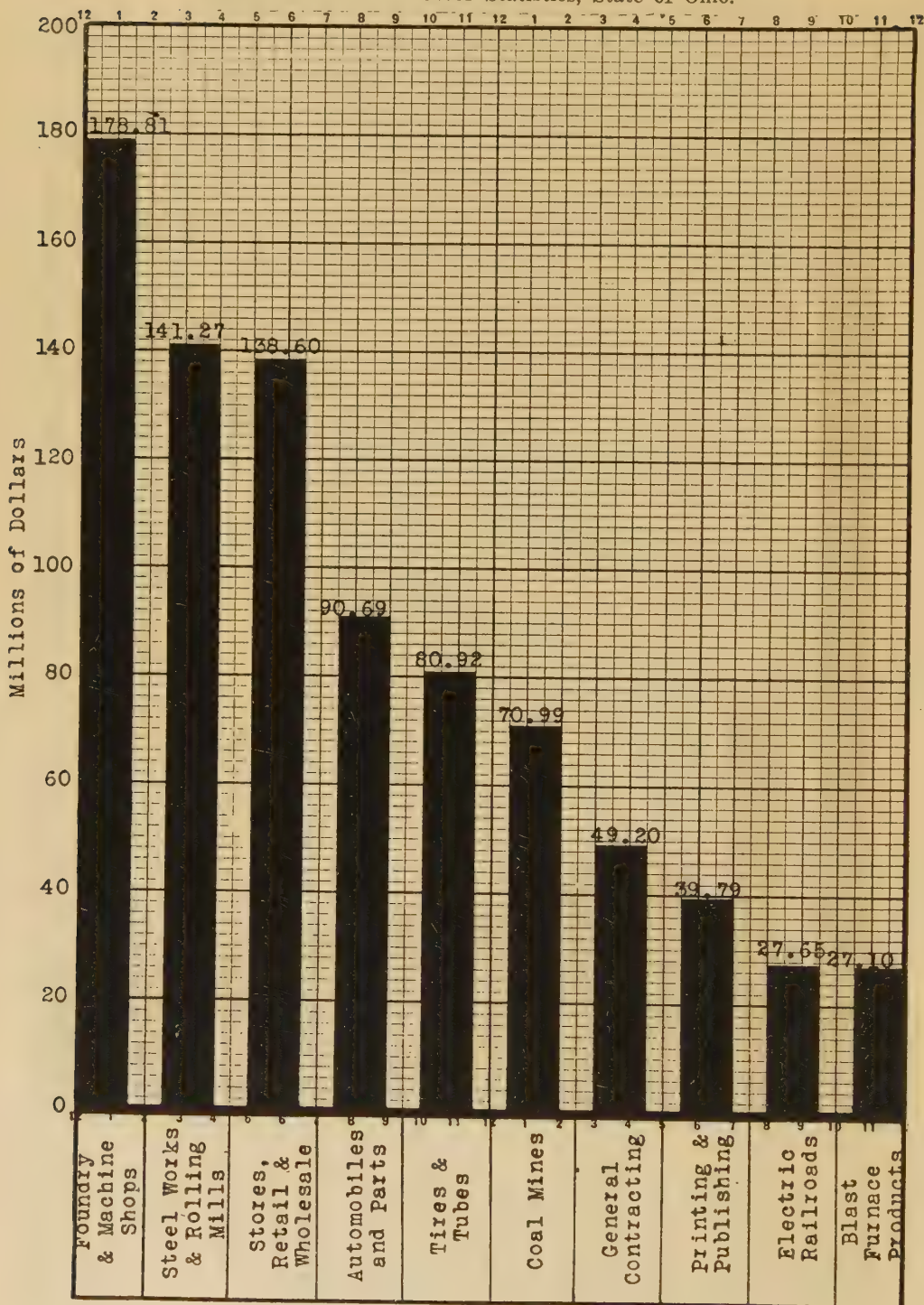


CHART II
TEN LEADING INDUSTRIES IN OHIO
MEASURED BY TOTAL WAGE AND SALARY PAYMENTS
1923

Source: Division of Labor Statistics, State of Ohio.



Wage Earners Employed

The monthly average number of workers employed in all branches of the construction industry in 1923, as reported to the Ohio Industrial Commission, was 69,202. The monthly average number of workers employed in all industries reporting to the Ohio Industrial Commission in the same year (including coal mines and quarries) was 1,124,158. The construction average is 6.2 per cent of the all-industry average.

Wage Payments and Rate of Wages

Chart III and Table I show the changes that have taken place in the relative position of the construction industry in Ohio during the period 1914-1924. It will be seen that there has been a fairly gradual increase in the relative importance of the construction industry.

TABLE I
RELATIVE IMPORTANCE OF THE OHIO CONSTRUCTION INDUSTRY
1914-1924

Total Construction Wage and Salary Payments as Per Cent of
Total Wage and Salary Payments of All Industries Reporting
Source: Division of Labor Statistics, State of Ohio

Year	Construction Payments as Per Cents of "All Industries"* Payments	Construction Payments as Per Cents of "All Industries" Payments Plus Coal Mining Payments
1914	5.90	5.66
1915	6.34	6.14
1916	7.10	6.80
1917	7.01	6.73
1918	5.92	5.61
1919	6.22	5.99
1920	7.11	6.80
1921	6.75	6.44
1922	-----	-----
1923	7.08	6.80
1924	8.06	7.83

*Coal Mining Data Not Included.

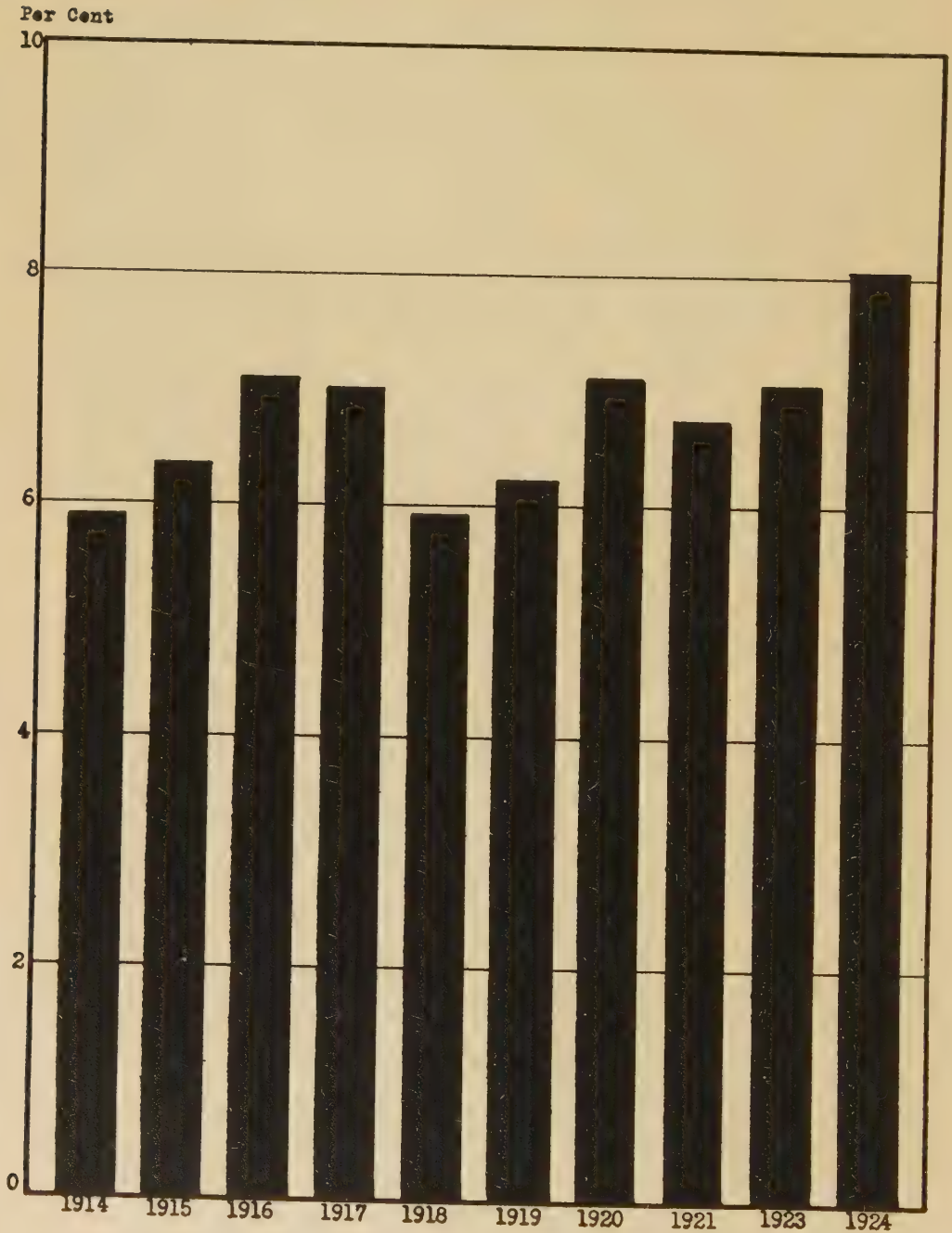
The course of wages in the Ohio construction industry since 1914 is shown in Tables II, III, and IV. These tables are based

CHART III

RELATIVE IMPORTANCE OF THE OHIO CONSTRUCTION INDUSTRY TOTAL WAGE AND SALARY PAYMENTS, 1914-1924

"Total Construction" Wage and Salary Payments as Percentage of Wage and
Salary Payments of "All Industries"*

Source: Division of Labor Statistics, State of Ohio



* Coal Mining Data Not Included

TABLE II
PERCENTAGE DISTRIBUTION OF WAGE EARNERS ACCORDING TO WEEKLY WAGES RECEIVED*
"ALL CONSTRUCTION"—STATE OF OHIO
1914-1924

Source: Division of Labor Statistics, State of Ohio

Year	Number Estab- lish- ments Report- ing	Number Wage Earners Reported	Per Cent Receiving Each Classified Weekly Wage								Total %
			Under \$5.00	\$5.00— \$14.99	\$15.00— \$24.99	\$25.00— \$34.99	\$35.00 and over	\$35.00— \$39.99	\$40.00— \$49.99	\$50.00 and over	
1914	2,291	60,854	% .4	% 51.5	% 35.1	% 11.6	% 1.3	% -----	% -----	% -----	100
1915	3,274	83,484	.3	50.8	34.2	13.2	1.5	-----	-----	-----	100
1916	3,984	112,855	.3	25.2	54.7	17.7	2.1	-----	-----	-----	100
1917	4,385	121,907	.1	10.4	60.3	22.7	6.5	-----	-----	-----	100
1918	4,273	111,624	.1	3.5	50.3	28.2	17.9	-----	-----	-----	100
1919	4,747	103,899	.3	2.5	29.7	37.3	30.3	12.8	13.2	4.3	100
1920	5,382	126,510	.1	1.2	12.3	32.1	54.3	17.4	18.8	18.1	100
1921	4,890	103,548	.3	5.0	37.6	20.1	37.0	10.8	16.5	9.7	100
1922†	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1923	5,883	127,915	.5	2.4	23.3	28.2	45.7	12.4	17.6	15.7	100
1924	7,364	134,053	.5	2.5	25.9	24.0	47.1	12.0	13.7	21.4	100

* For the week of greatest employment during each year.

† The record not available.

TABLE III
WAGE RATES RECEIVED BY WAGE EARNERS
CUMULATIVE DOWNWARD PERCENTAGE DISTRIBUTION
Per Cent Receiving Indicated Weekly Wage

Year	\$0.00 and More	\$5.00 and More	\$15.00 and More	\$25.00 and More	\$35.00 and More	\$40.00 and More	\$50.00 and More
1914	100.0	99.6	48.1	13.0	1.3	-----	-----
1915	100.0	99.7	48.9	14.7	1.5	-----	-----
1916	100.0	99.7	74.5	19.8	2.1	-----	-----
1917	100.0	99.9	89.5	29.2	6.5	-----	-----
1918	100.0	99.9	96.4	46.1	17.9	-----	-----
1919	100.0	99.7	97.2	67.5	30.2	17.4	4.2
1920	100.0	99.9	98.7	86.4	54.3	36.9	18.1
1921	100.0	99.7	94.7	57.1	37.0	26.2	9.7
1922	-----	-----	-----	-----	-----	-----	-----
1923	100.0	99.5	97.1	73.8	45.6	33.2	15.6
1924	100.0	99.5	97.0	71.1	47.1	35.1	21.4

TABLE IV
WAGE RATES RECEIVED BY WAGE EARNERS
CUMULATIVE UPWARD PERCENTAGE DISTRIBUTION
Per Cent Receiving Indicated Weekly Wage

Year	Less than \$5.00	Less than \$15.00	Less than \$25.00	Less than \$35.00	Less than \$40.00	Less than \$50.00
1914	0.4	51.9	87.0	98.6	-----	-----
1915	.3	51.1	85.3	97.9	-----	-----
1916	.3	25.5	80.2	97.9	-----	-----
1917	.1	10.5	70.8	93.5	-----	-----
1918	.1	3.6	53.9	82.1	-----	-----
1919	.3	2.8	32.5	69.8	82.6	95.8
1920	.1	1.3	13.6	45.7	63.1	81.9
1921	.3	5.3	42.9	63.0	73.8	90.3
1922	-----	-----	-----	-----	-----	-----
1923	.5	2.9	26.2	54.4	66.8	84.4
1924	.5	3.0	28.9	52.9	64.9	78.6

on reports made to the Ohio Division of Labor Statistics by all construction firms which employ normally five or more persons. It will be noted that the class intervals are not equal throughout the table. The classification used is the most comparable one possible, in view of the changes in the reports for the period under review. Table II shows the percentage frequency in each classification group. It will be noted that 51.5 per cent of the wage earners in 1914 were in the \$5.00 to \$14.99 class; the percentage frequency in the same class in 1924 was only 2.5 per cent. The cumulative percentage frequency tables (III and IV) are even more interesting. For instance, in the downward cumulation table it will be noted that only 1.3 per cent of the wage earners in 1914 received \$35.00 or more weekly, while the corresponding figure for 1924 was 47.1 per cent. The upward cumulation table shows that in 1914 51.9 per cent of the wage earners received less than \$15.00 per week, while in 1924 only 3 per cent received less than \$15.00 per week.

A comparison of the payroll of the average construction firm and the average "All Industries" firm is shown in Table V. The significance of the table is that it shows that the average construction firm is much smaller than the average firm of "All Industries," measured by the average payroll.

Size of Establishments

The typical construction firm is a small one. The industry, while one of the largest in the nation, is still characterized by small scale operations for the most part. Table VI shows the payroll and number of employees of the average construction firm in Ohio for the years 1914 to 1924. The changes that have taken place are apparent. In all cases there has been an increase in the payroll of the average firm and a decrease in the average number of wage earners employed.

TABLE V
COMPARISON OF WAGE AND SALARY PAYMENTS
OF AVERAGE CONSTRUCTION FIRM AND AVERAGE FIRM OF ALL INDUSTRIES
STATE OF OHIO 1914-1924

Source: Division of Labor Statistics, State of Ohio.

Year	To Wage Earners		To Clerical Workers		To Salespeople		To Superintendents and Managers		Total Wage and Salary Payments	
	All Industries	Construction	All Industries	Construction	All Industries	Construction	All Industries	Construction	All Industries	Construction
1914	\$23,448	\$ 9,358	\$ 2,972	\$ 466	\$ 1,209	\$ 78	\$ 1,596	\$ 440	\$29,844	\$11,222
1915	30,610	11,988	3,369	520	1,438	104	1,743	500	29,226	10,342
1916	36,435	13,665	3,982	572	1,529	150	2,022	596	37,161	13,112
1917	43,737	14,661	4,988	849	1,653	132	2,481	1,004	43,967	14,983
1918	46,166	15,952	6,456	856	2,058	224	3,097	843	52,859	16,647
1919	53,402	21,474	7,179	1,088	2,302	228	3,206	1,017	57,777	17,874
1920	84,812	13,401	6,943	974	2,523	221	3,505	1,012	66,089	23,808
1921									47,784	15,607
1922										
1923	47,818	17,084	7,284	937	2,824	224	3,680	1,009	61,606	19,254
1924	39,740	15,526	6,801	901	2,685	246	3,385	861	52,611	17,533

TAB
CHANGES IN TOTAL WAGE AND SALARY PAYMENT
EMPLOYED BY THE AVERAGE
1914

Source: Division of Labor

Year	Average "All Construction" Firm		Average Brick, Stone and Cement Firm		Average Electrical Contracting Firm		Average General Contracting Firm		Average Painting and Decorating Firm	
	Annual Payroll	Av. No. of Wage Earners	Annual Payroll	Av. No. of Wage Earners	Annual Payroll	Av. No. of Wage Earners	Annual Payroll	Av. No. of Wage Earners	Annual Payroll	Av. No. of Wage Earners
1914	\$11,222.00	19.9	\$ 8,533.00	12.3	\$10,983.00	11.3	\$13,803.00	18.3	\$ 7,236.00	9.9
1915	10,342.00	16.9	6,342.00	8.5	10,288.00	9.2	12,792.00	16.3	6,148.00	6.6
1916	13,112.00	19.0	8,716.00	10.5	12,338.00	10.3	18,341.00	30.8	6,881.00	6.6
1917	14,983.00	18.7	10,871.00	11.3	15,568.00	12.4	21,271.00	21.3	7,016.00	6.6
1918	16,647.00	16.3	9,449.00	7.9	18,276.00	11.7	22,692.00	17.9	7,119.00	5.5
1919	17,874.00	14.6	9,796.00	7.3	19,365.00	10.8	21,934.00	14.6	30,044.00	6.6
1920	23,808.00	15.3	14,729.00	8.6	26,497.00	10.9	34,189.00	17.7	10,953.00	5.5
1921	15,607.00	11.9	10,963.00	7.0	18,740.00	8.2	18,185.00	11.2	8,956.00	5.5
1922	-----	13.6	-----	8.2	-----	6.9	-----	12.2	-----	5.5
1923	19,254.00	11.4	15,991.00	9.4	26,229.00	12.2	22,519.00	12.3	10,872.00	5.5
1924	17,533.00	11.6	14,456.00	8.2	27,406.00	9.8	20,619.00	10.6	8,503.00	4.4

VI
S AND AVERAGE NUMBER OF WAGE EARNERS
OHIO CONSTRUCTION FIRM

24
Statistics, State of Ohio

Average Plastering and Lathing Firm		Average Plumbing and Steam Fitting Firm		Average Sand and Gravel Excavat- ing Firm		Average Sheet Metal Work and Roofing Firm		Average Street, Road and Sewer Contracting Firm		Average Ventilat- ing and Heating Firm	
Annual Pay- roll	Av. No. of Wage Earners	Annual Pay- roll	Av. No. of Wage Earners	Annual Pay- roll	Av. No. of Wage Earners	Annual Pay- roll	Av. No. of Wage Earners	Annual Pay- roll	Av. No. of Wage Earners	Annual Pay- roll	Av. No. of Wage Earners
\$10,923.00	12.2	\$ 9,091.00	10.2	\$ 7,974.00	12.0	\$ 7,507.00	9.2	\$11,184.00	22.6	\$17,080.00	18.2
9,986.00	9.1	9,540.00	9.7	7,779.00	10.8	7,304.00	8.5	10,312.00	17.2	13,634.00	13.7
12,006.00	11.1	10,371.00	9.6	9,222.00	10.9	7,669.00	8.3	12,551.00	17.8	18,417.00	15.9
10,460.00	8.5	11,249.00	9.0	10,145.00	10.4	8,313.00	8.0	16,769.00	19.9	19,559.00	17.7
10,522.00	17.3	11,223.00	7.6	17,735.00	11.6	10,069.00	7.0	20,871.00	20.2	15,248.00	10.3
8,123.00	5.1	13,202.00	7.9	15,930.00	11.2	11,395.00	6.7	19,783.00	15.9	15,545.00	9.4
15,112.00	7.0	17,511.00	8.2	17,112.00	10.1	15,389.00	7.7	25,617.00	16.3	18,544.00	8.7
13,424.00	6.9	15,430.00	7.5	12,708.00	8.2	11,796.00	6.4	20,318.00	16.5	16,353.00	7.2
-----	7.1	-----	7.9	-----	9.3	-----	6.8	-----	15.1	-----	6.0
17,735.00	7.8	18,393.00	9.1	16,477.00	9.9	15,672.00	7.9	22,533.00	16.6	17,826.00	9.7
16,475.00	7.3	17,914.00	8.2	14,785.00	9.5	14,508.00	7.1	20,894.00	15.9	20,465.00	8.3

CHAPTER II

STATISTICAL ANALYSIS OF OHIO CONSTRUCTION RECORDS

Before the problem of seasonal fluctuations in employment in the Ohio construction industry is undertaken, an analysis of the building records of the State and of the principal cities will be made in order that the significance of the industry may be shown.

The Secular Trend in Ohio Construction

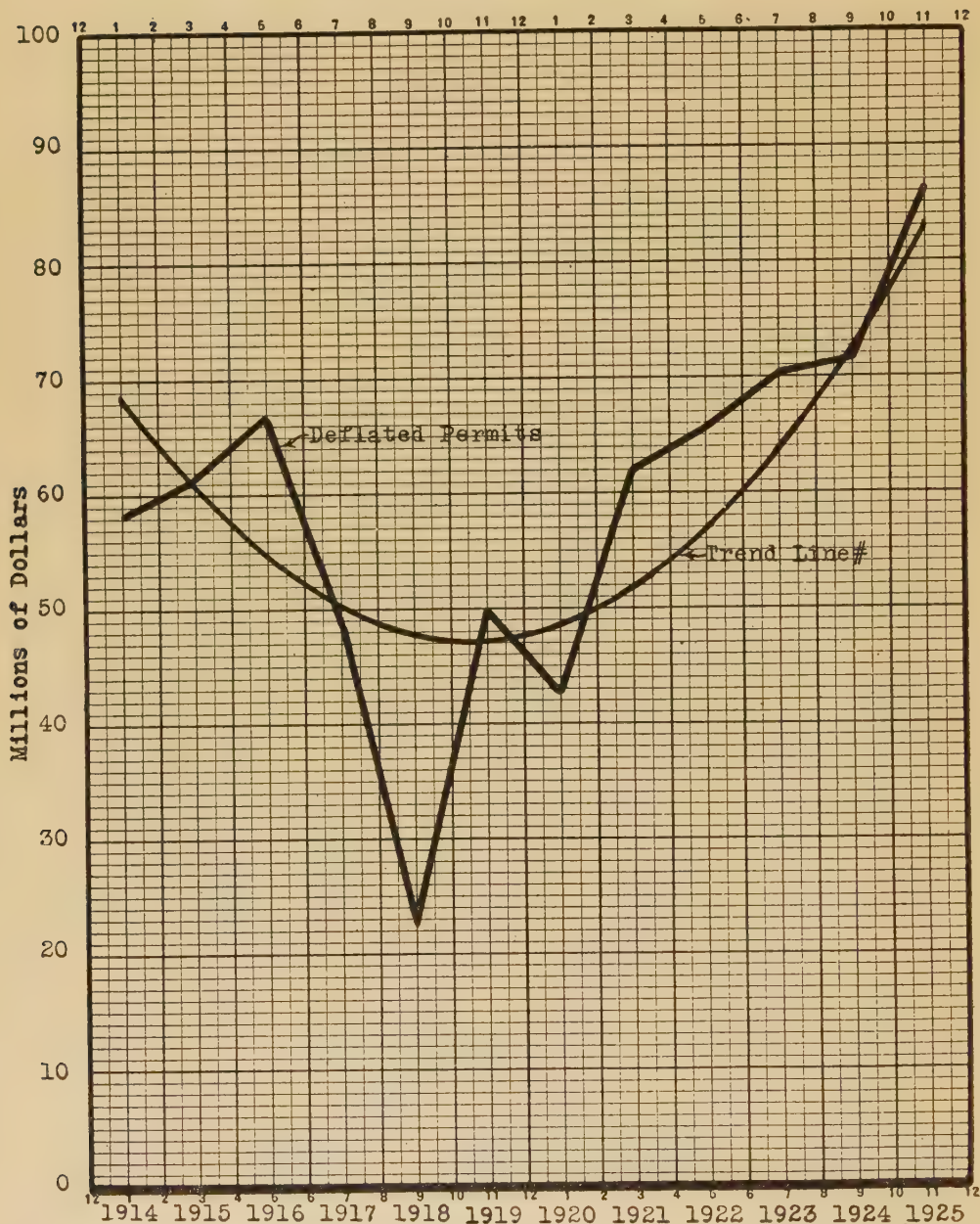
The only available record over the entire period since 1914 is the record of building permits issued by the leading cities of the State. These permit figures of the seven largest cities have been combined and their deflated¹ values are shown in Chart IV and Table VII. The peculiar direction is apparent. The war-time slack in building followed by the post-war boom is clearly indicated. The records of building permits of the individual cities are shown in Charts V and VI. The deflated¹ values have been charted.

A better measure of activity is available for the period since 1919. This is the record of construction contracts awarded in the State and in the principal cities, as reported by the F. W. Dodge Corporation. The post-war trend in Ohio Construction is shown in Charts VII and VIII, the first chart being based on the actual values reported and the second being based on values deflated to take account of changes in the cost of construction.² The trend apparent in the case of actual values is almost entirely due to changes in the construction dollar. When these values are put on a comparable basis, i. e., by charting deflated values, as shown by Chart VIII the trend is only very slightly upward.

¹The deflating index used is an average of the four cost of construction indices for the Pittsburgh District, compiled and computed by the American Appraisal Company, Milwaukee, and made available through their courtesy. The four indices represent the cost of construction of four types of structures (frame; brick, wood frame; brick, steel frame; reinforced concrete) and are averages of costs in the cities of Cleveland, Cincinnati, Pittsburgh, and Louisville, in terms of 1913 costs as a base.

²The cost of construction index described in the preceding footnote was used. Prior to 1924, monthly values of the index were secured by interpolation from the quarterly index published, on the assumption of a uniform increment from month to month.

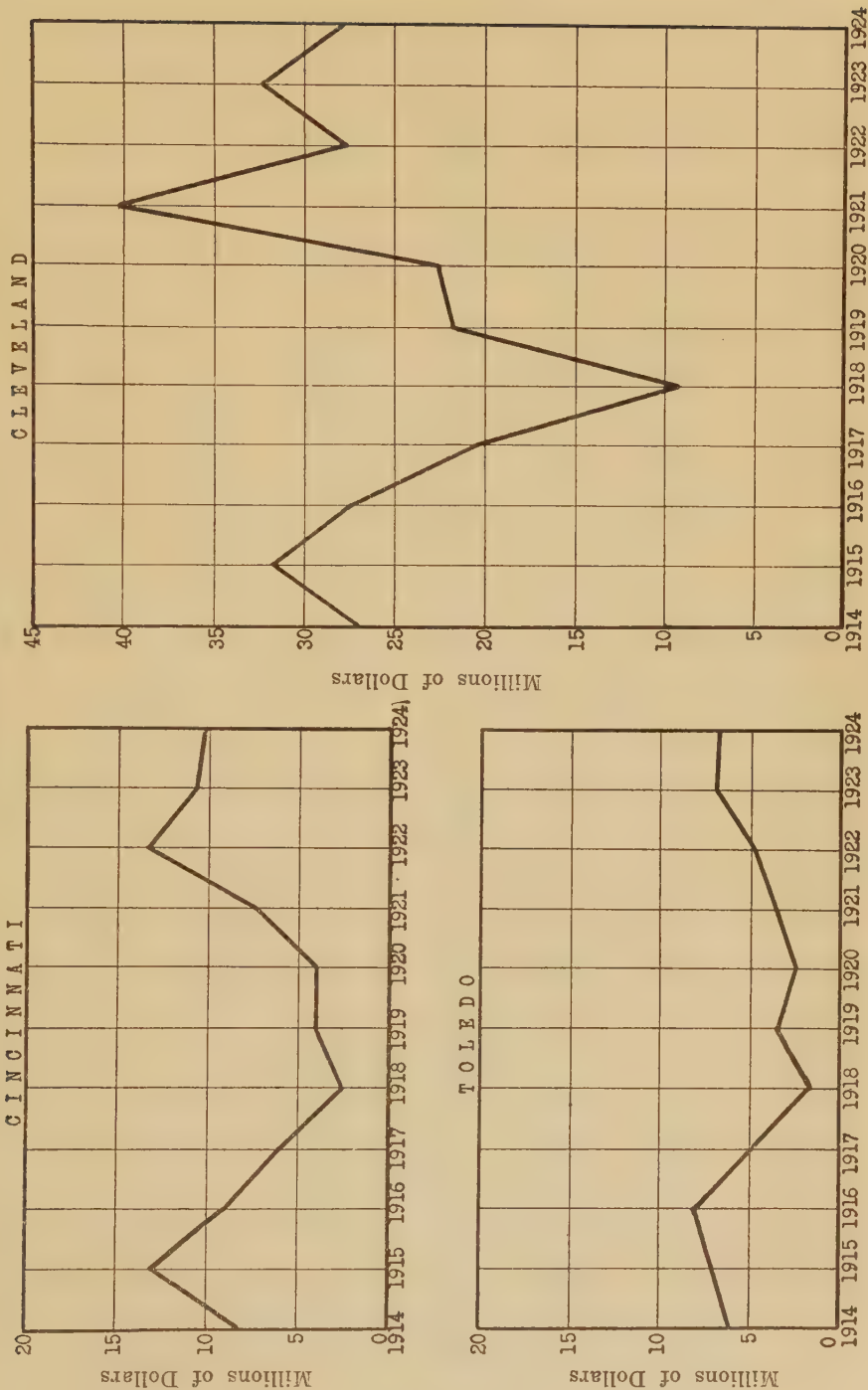
CHART IV
OHIO BUILDING PERMITS
TOTAL OF PERMITS ISSUED IN SEVEN LARGEST CITIES
1914-1925
(In terms of 1914 Costs)*
Source: U. S. Department of Labor



* Deflating Index—The General Index of the Cost of Construction for the Pittsburgh District (which includes Ohio) computed by the American Appraisal Company, Milwaukee. 1914 = 100.

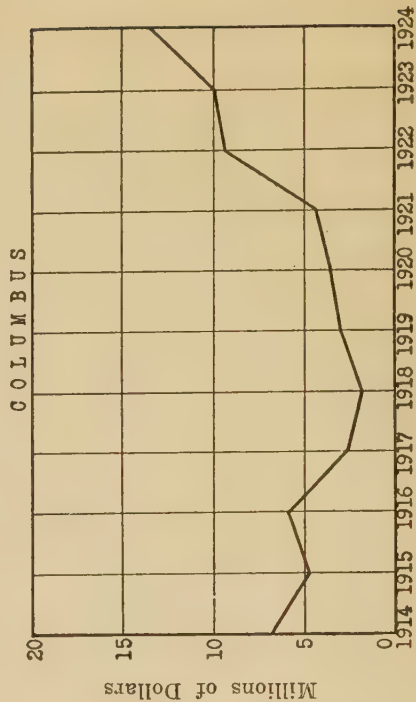
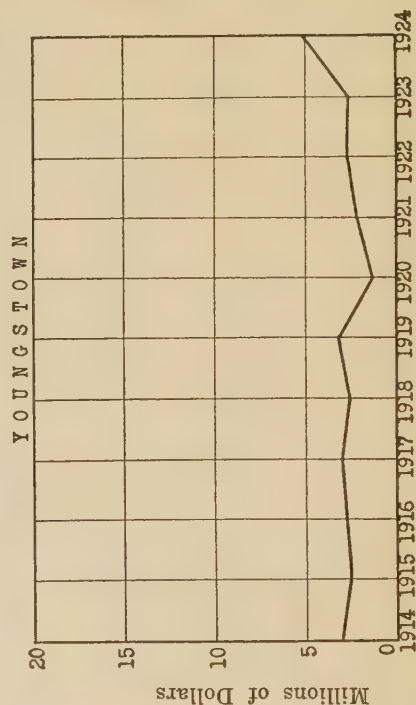
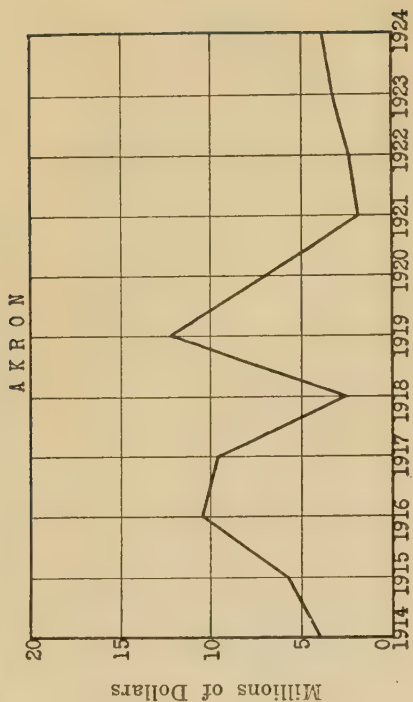
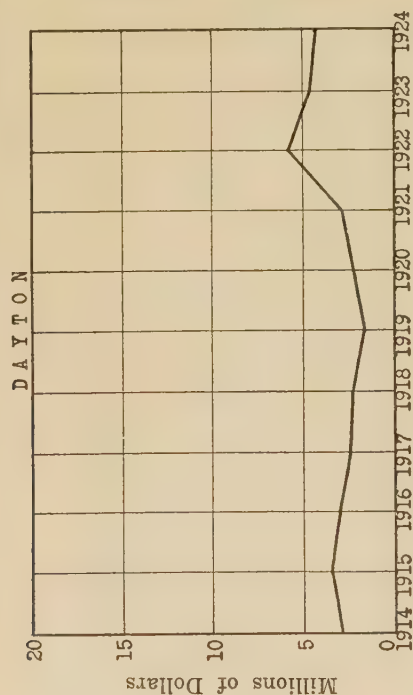
Equation of Line of Trend $y = 47.7 + .655x + .234x^2$.

CHART V
BUILDING PERMITS ISSUED IN OHIO CITIES
1914-1924
Deflated Values*



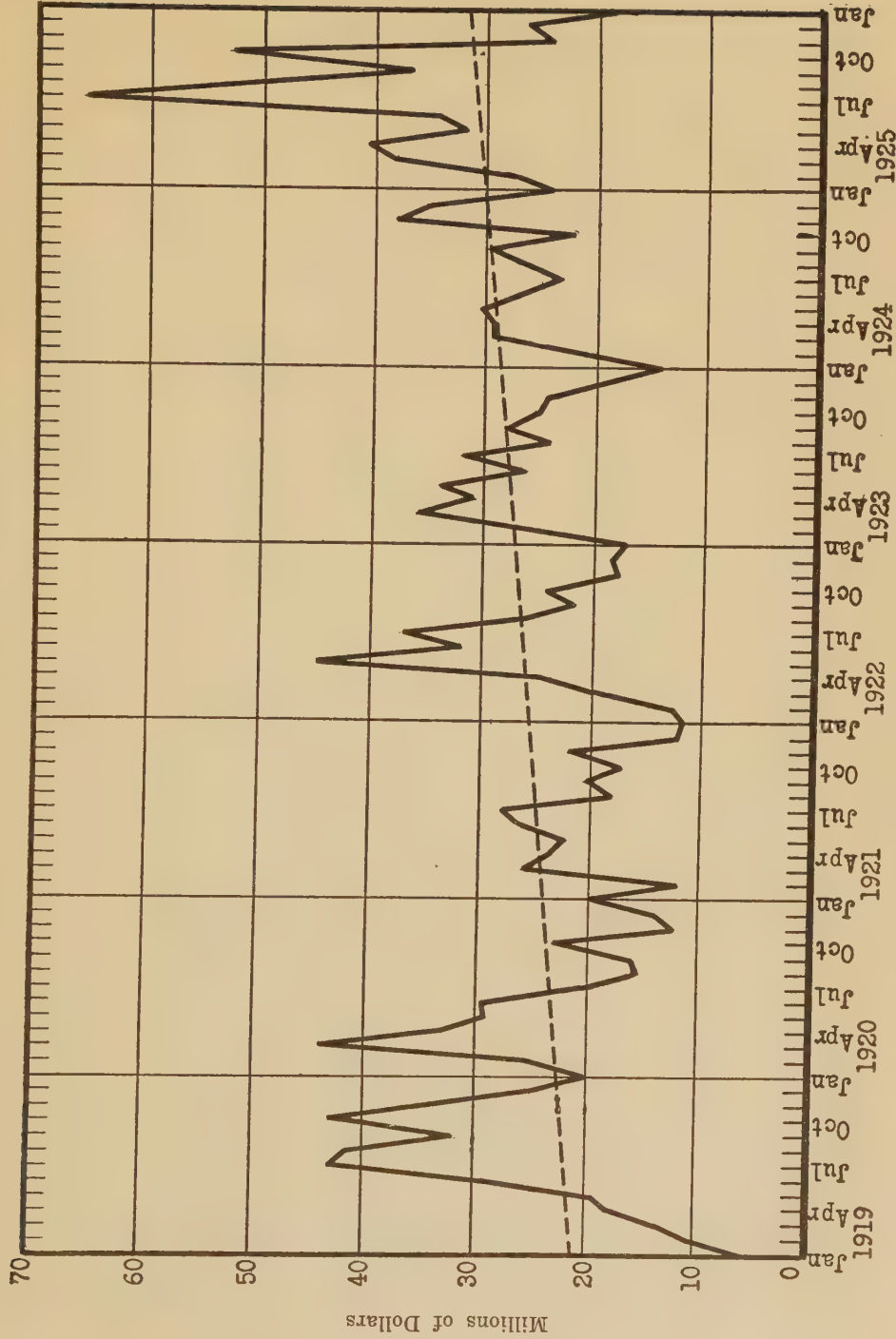
*Deflated by the general index of cost of construction for the Pittsburgh District, compiled by the American Appraisal Co.

CHART VI
BUILDING PERMITS ISSUED IN OHIO CITIES
1914-1924
Deflated Values*



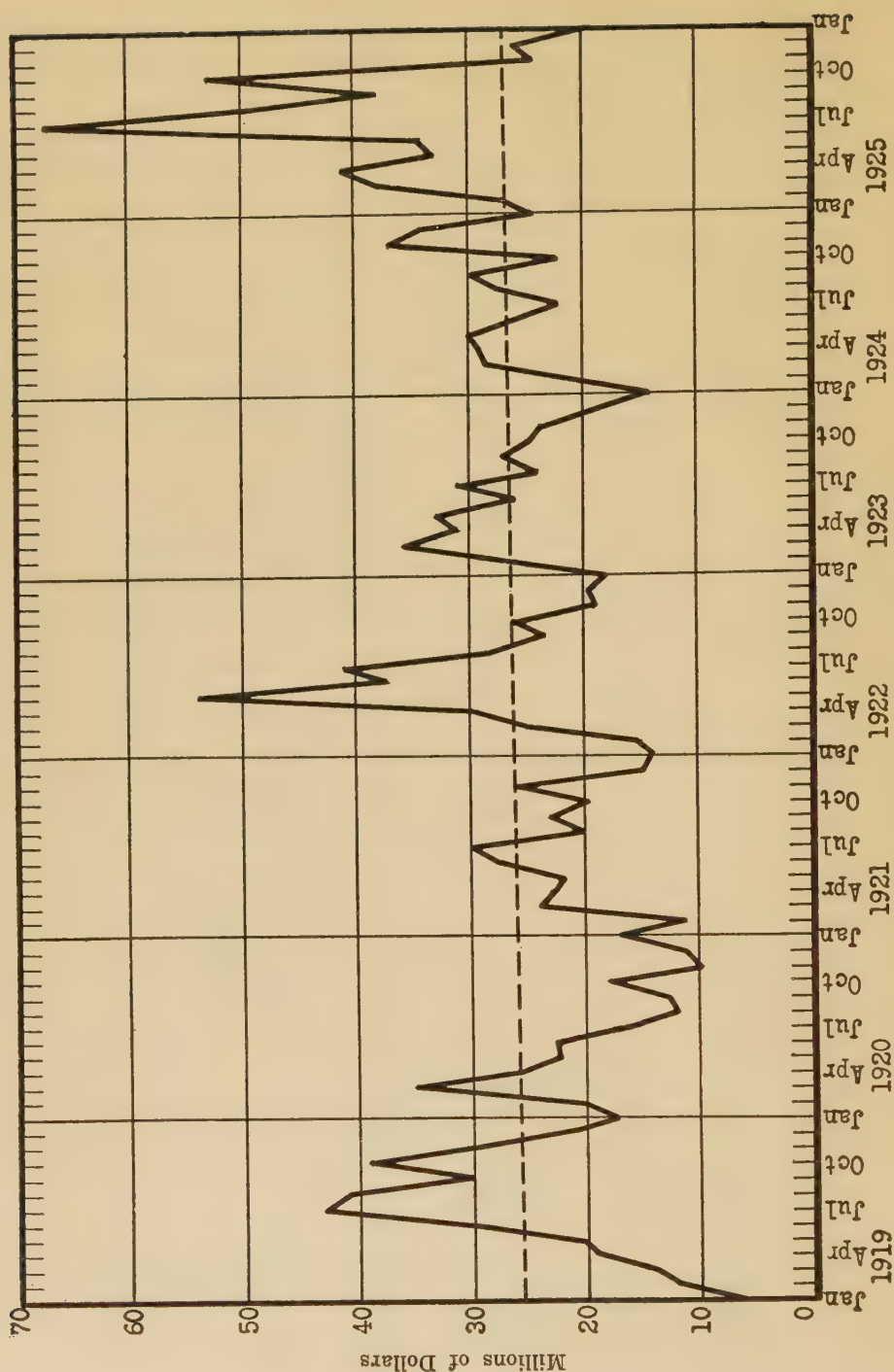
*Deflated by the general index of cost of construction for the Pittsburgh District,
compiled by the American Appraisal Co.

CONSTRUCTION CONTRACTS AWARDED IN OHIO BY MONTHS
 JANUARY, 1919—JANUARY, 1926
 Source: F. W. Dodge Corporation



*Deflation by an adaptation of the general index of cost of construction for the Pittsburgh District, compiled by the American Appraisal Co.

CHART VIII
CONSTRUCTION CONTRACTS AWARDED IN OHIO BY MONTHS
JANUARY, 1919—JANUARY, 1926
(In Terms of 1919 Construction Costs)*
Source: F. W. Dodge Corporation



* Deflated by the general index of cost of construction for the Pittsburgh District, compiled by the American Appraisal Co.

TABLE VII
OHIO BUILDING PERMITS¹
1914-1924

Line of Trend Fitted to Deflated Values
(In Millions)

Source: U. S. Department of Labor

Year	Actual Valuation of Permits	Deflating Index ²	Deflated Values	Trend of Values ³
1914	58.2	100	58.2	68.8
1915	63.2	103	61.9	60.8
1916	80.8	121	66.8	54.6
1917	73.0	149	49.0	50.3
1918	39.3	176	22.3	47.8
1919	108.9	218	50.0	47.3
1920	121.6	284	42.8	48.6
1921	133.7	215	62.2	51.8
1922	129.9	198	65.6	56.8
1923	158.1	225	70.3	63.7
1924	163.8	229	71.5	72.5
1925	190.4	221	86.1	83.2

¹Total of Seven Largest Cities.

²General Cost of Construction, Pittsburgh District, American Appraisal Company.

³Equation of Trend Line: $y = 47.7 + .665x + .234x^2$

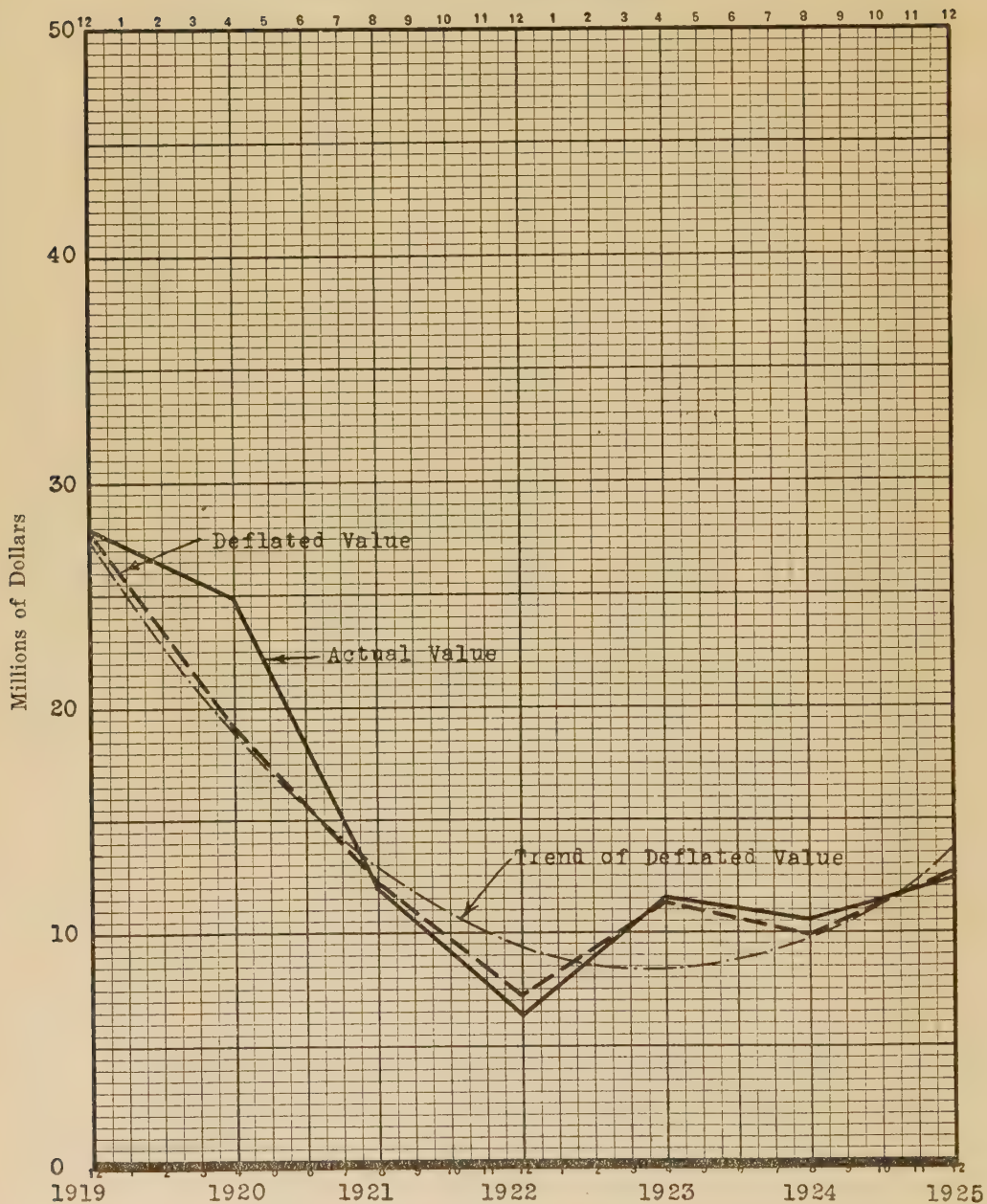
The general direction of construction in the seven leading cities of the State since 1919 is shown in Charts IX to XV. It will be noted that both actual and deflated values have been charted. The trend lines charted represent the trend of the deflated values.

Seasonal Variation in Ohio Construction Records

It is well known that construction contracts are subject to seasonal peaks and recessions because of the highly seasonal nature of actual building operations. However, it is apparent from an examination of the actual monthly record of contracts awarded in Ohio that this seasonal movement is quite irregular, so much so that any seasonal index computed from such a short period is tentative only and subsequent developments are apt to reveal that the index is unreliable. The seasonal movement, as revealed by the period 1919-1925, is shown graphically in Chart XVI. This chart

CHART IX
CONSTRUCTION CONTRACTS AWARDED IN AKRON
1919-1925

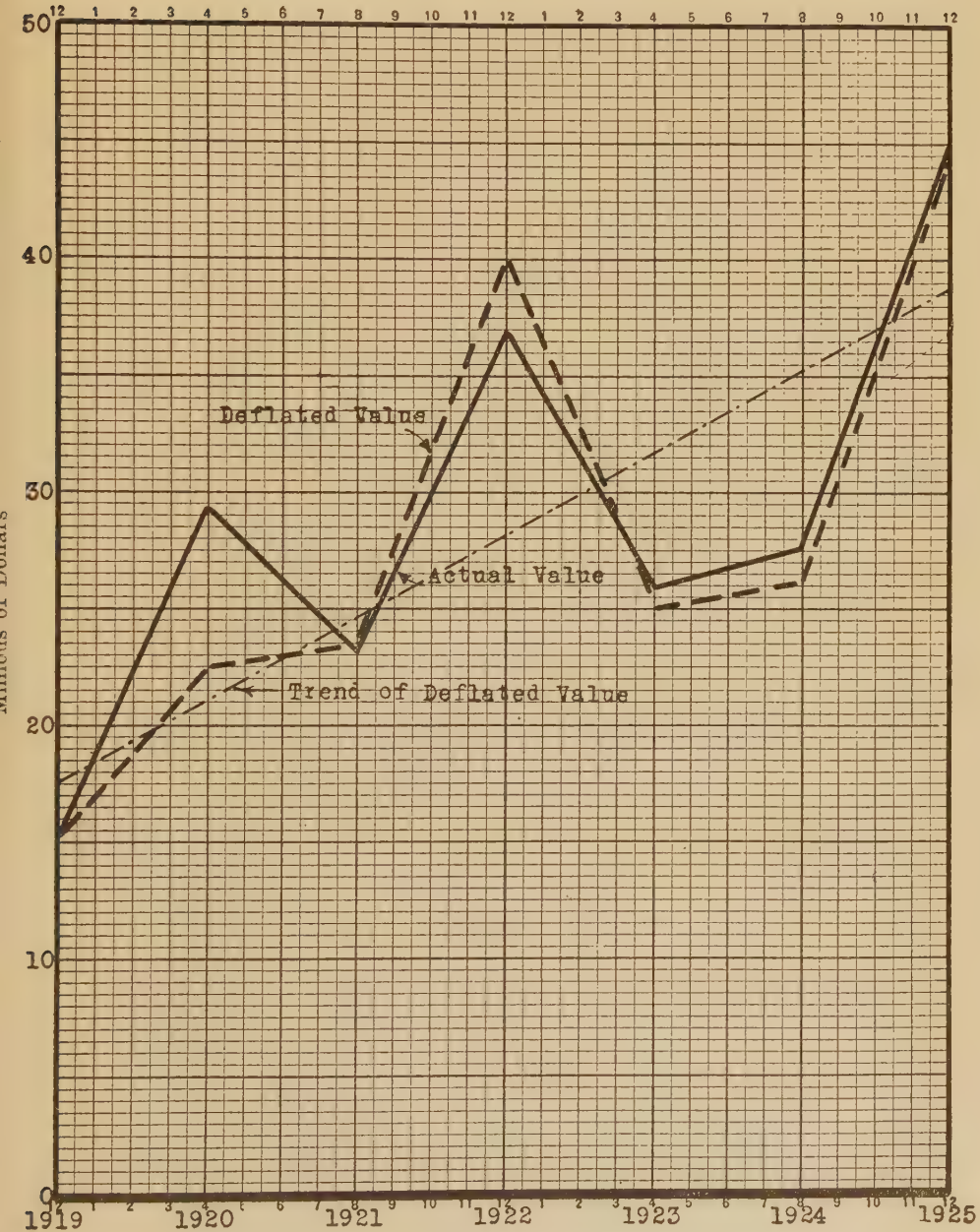
Actual and Deflated* Value
Source: F. W. Dodge Corporation



*Deflated by the general index of cost of construction for the Pittsburgh District compiled by the American Appraisal Co.
Trend Equation $y = 10.72 - 2.308x + .889x^2$

CHART X
CONSTRUCTION CONTRACTS AWARDED IN CINCINNATI
1919-1925

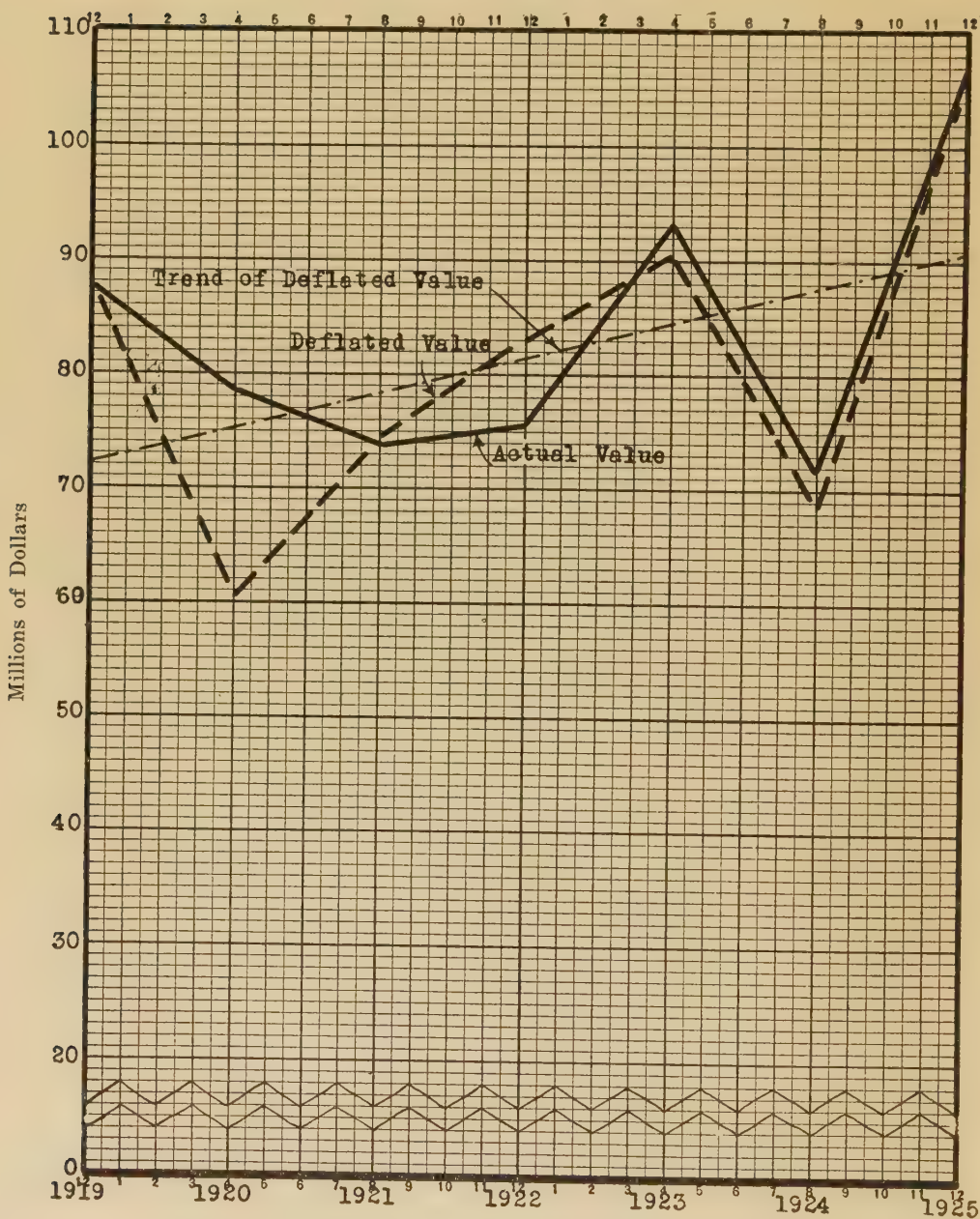
Actual and Deflated* Value
Source: F. W. Dodge Corporation



*Deflated by the general index of cost of construction for the Pittsburgh District compiled by the American Appraisal Co.
Trend Equation $y = 28.200 + 3.479x$

CHART XI
CONSTRUCTION CONTRACTS AWARDED IN CLEVELAND
1919-1925

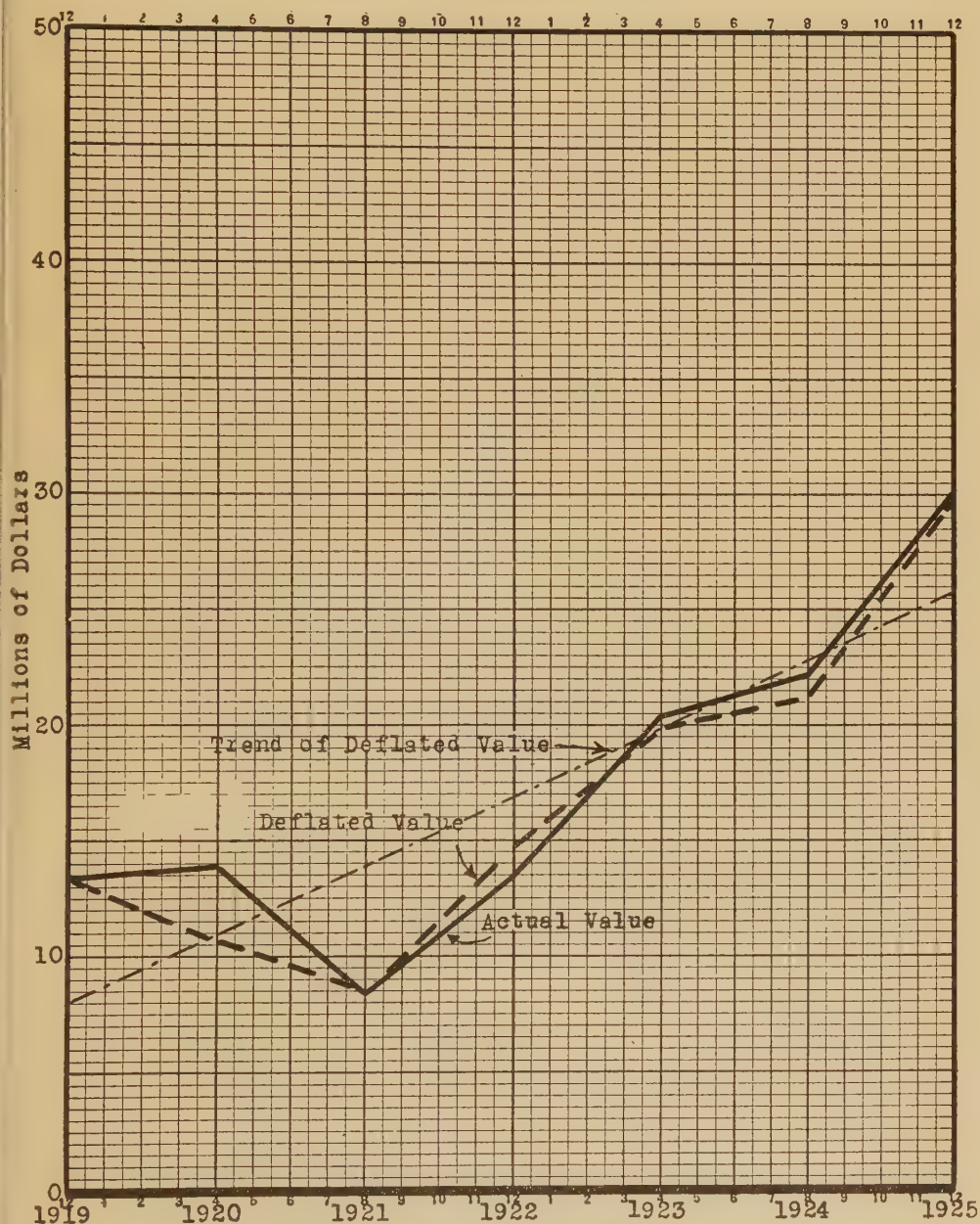
Actual and Deflated* Value
Source: F. W. Dodge Corporation



*Deflated by the general index of cost of construction for the
Pittsburgh District compiled by the American Appraisal Co.
Trend Equation $y = 81.487 + 3.040x$

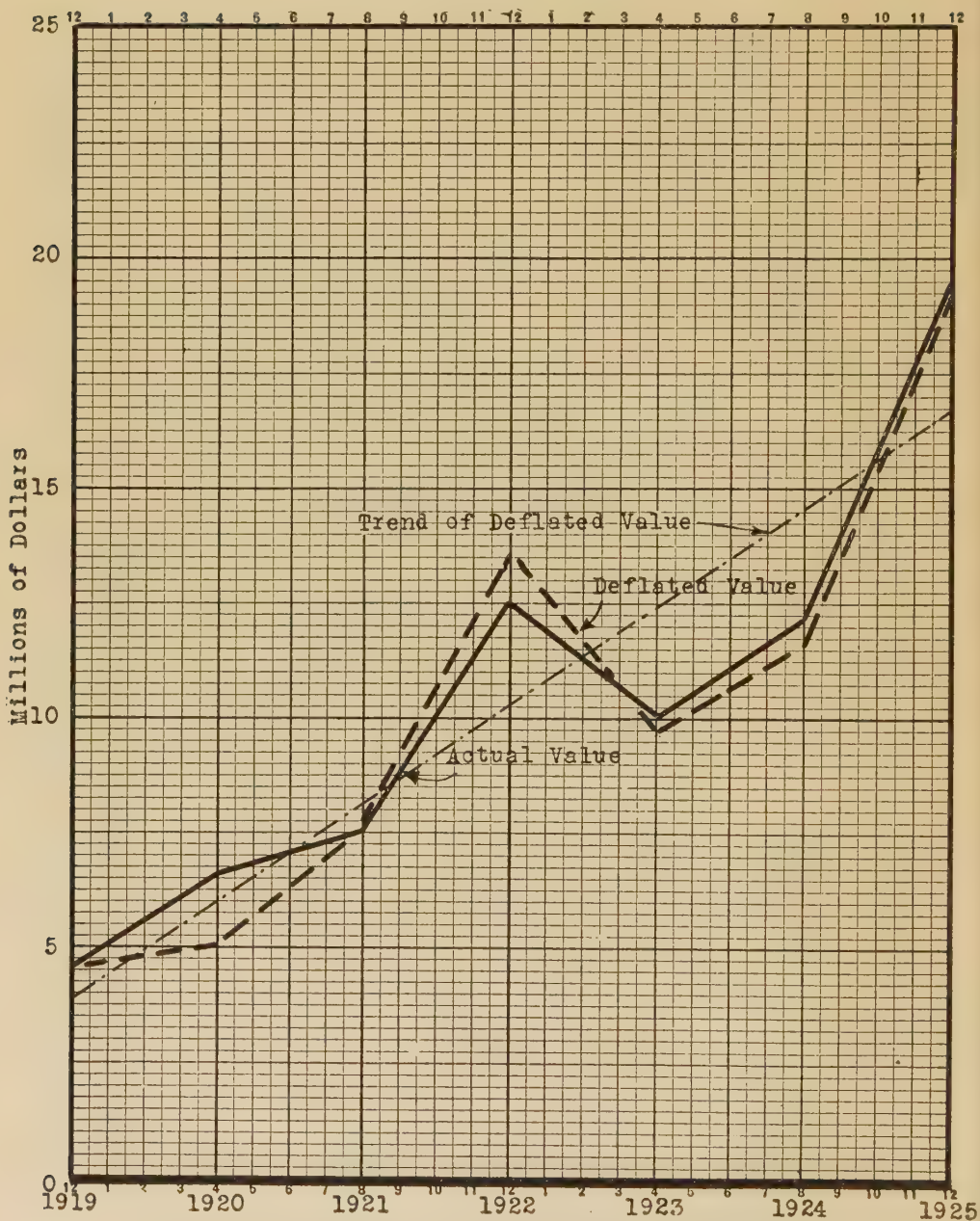
CHART XII
CONSTRUCTION CONTRACTS AWARDED IN COLUMBUS
1919-1925

Actual and Deflated* Value
Source: F. W. Dodge Corporation



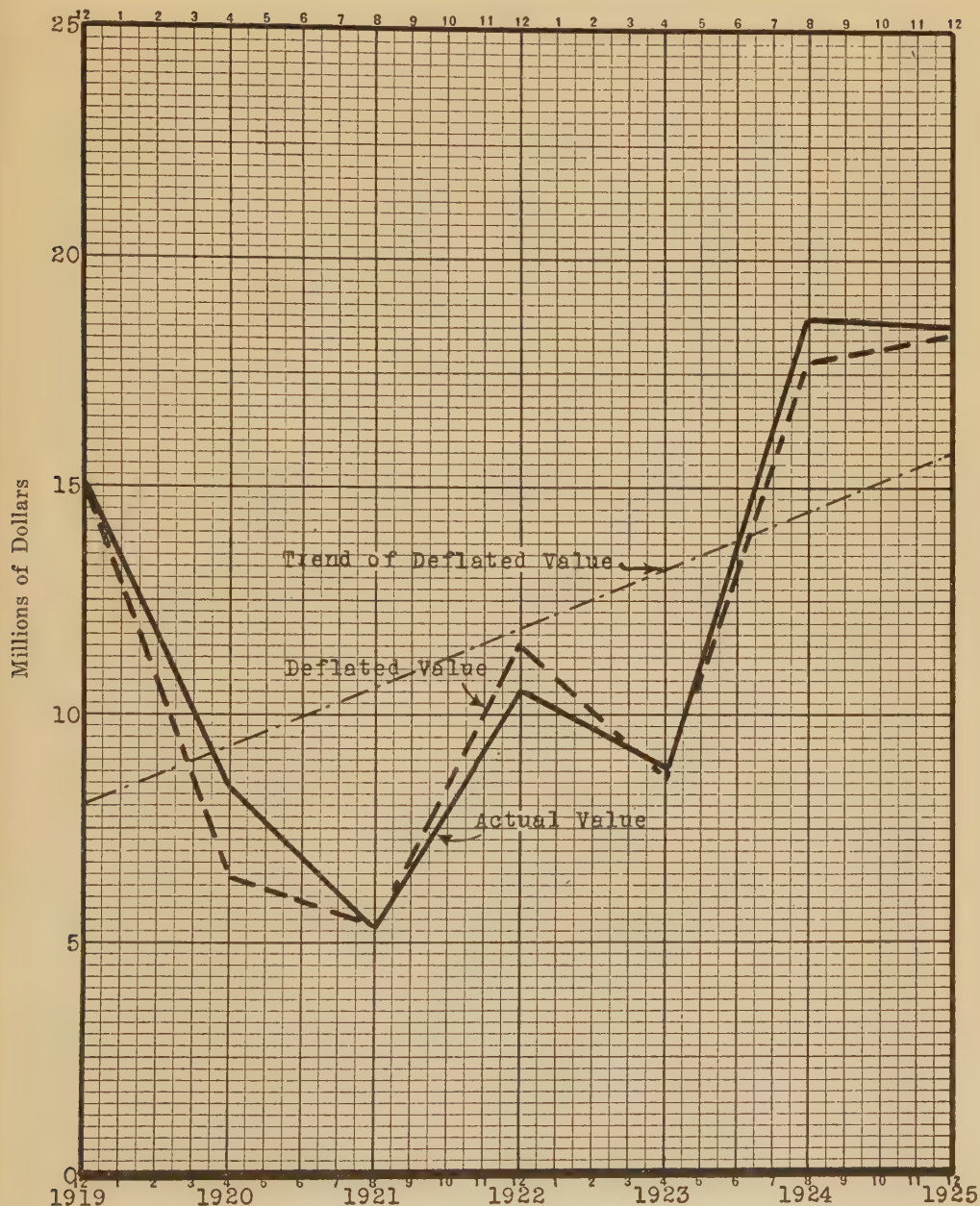
*Deflated by the general index of cost of construction for the
Pittsburgh District compiled by the American Appraisal Co.
Trend Equation $y = 16.837 + 2.931x$

CHART XIII
CONSTRUCTION CONTRACTS AWARDED IN DAYTON
1919-1925
Actual and Deflated* Value
Source: F. W. Dodge Corporation



*Deflated by the general index of cost of construction for the Pittsburgh District compiled by the American Appraisal Co.
Trend Equation $y = 10.279 + 2.125x$

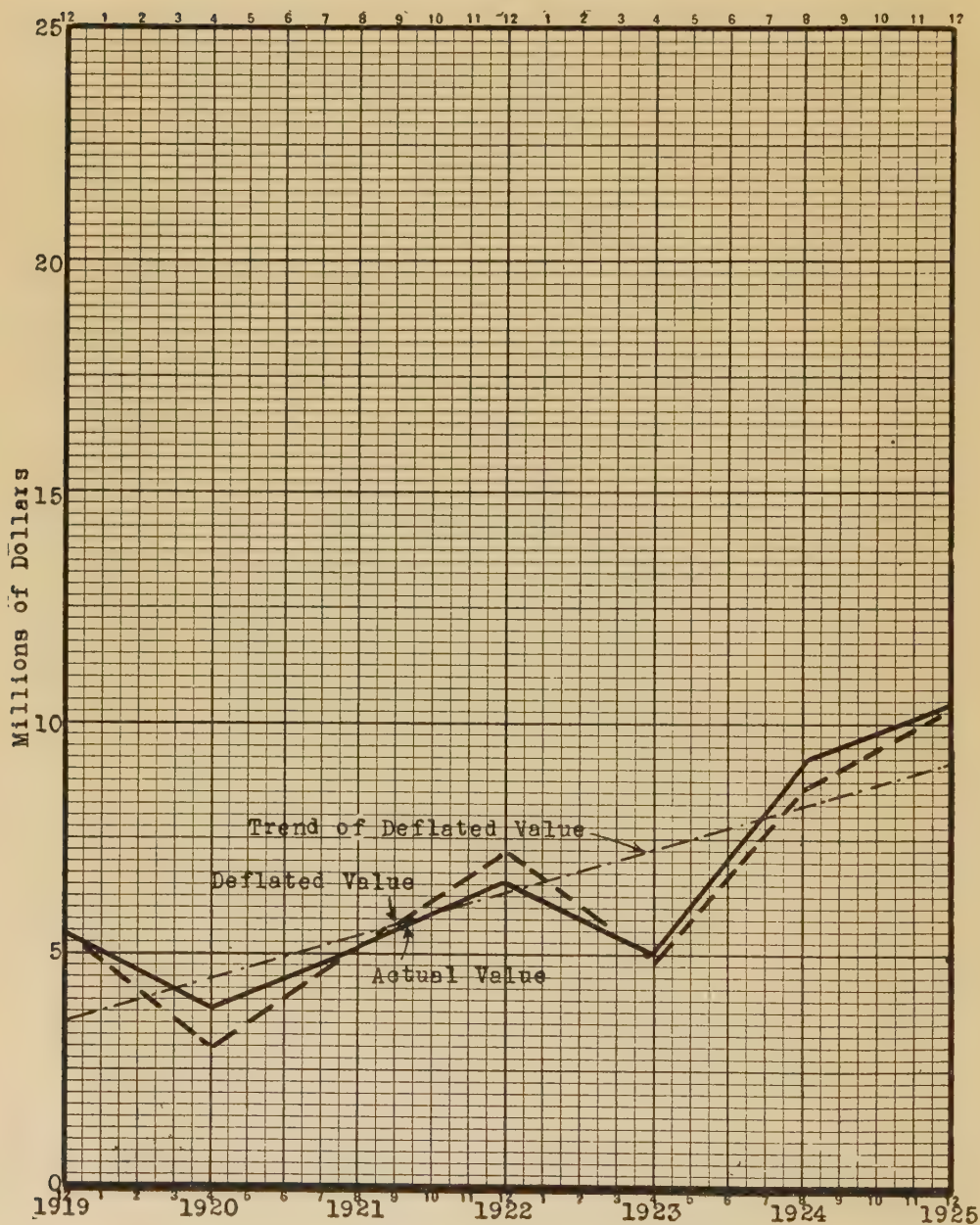
CHART XIV
CONSTRUCTION CONTRACTS AWARDED IN TOLEDO
1919-1925
Actual and Deflated* Value
Source: F. W. Dodge Corporation



*Deflated by the general index of cost of construction for the
Pittsburg District compiled by the American Appraisal Co.
Trend Equation $y = 11.880 + 1.281x$

CHART XV
CONSTRUCTION CONTRACTS AWARDED IN YOUNGSTOWN
1919-1925

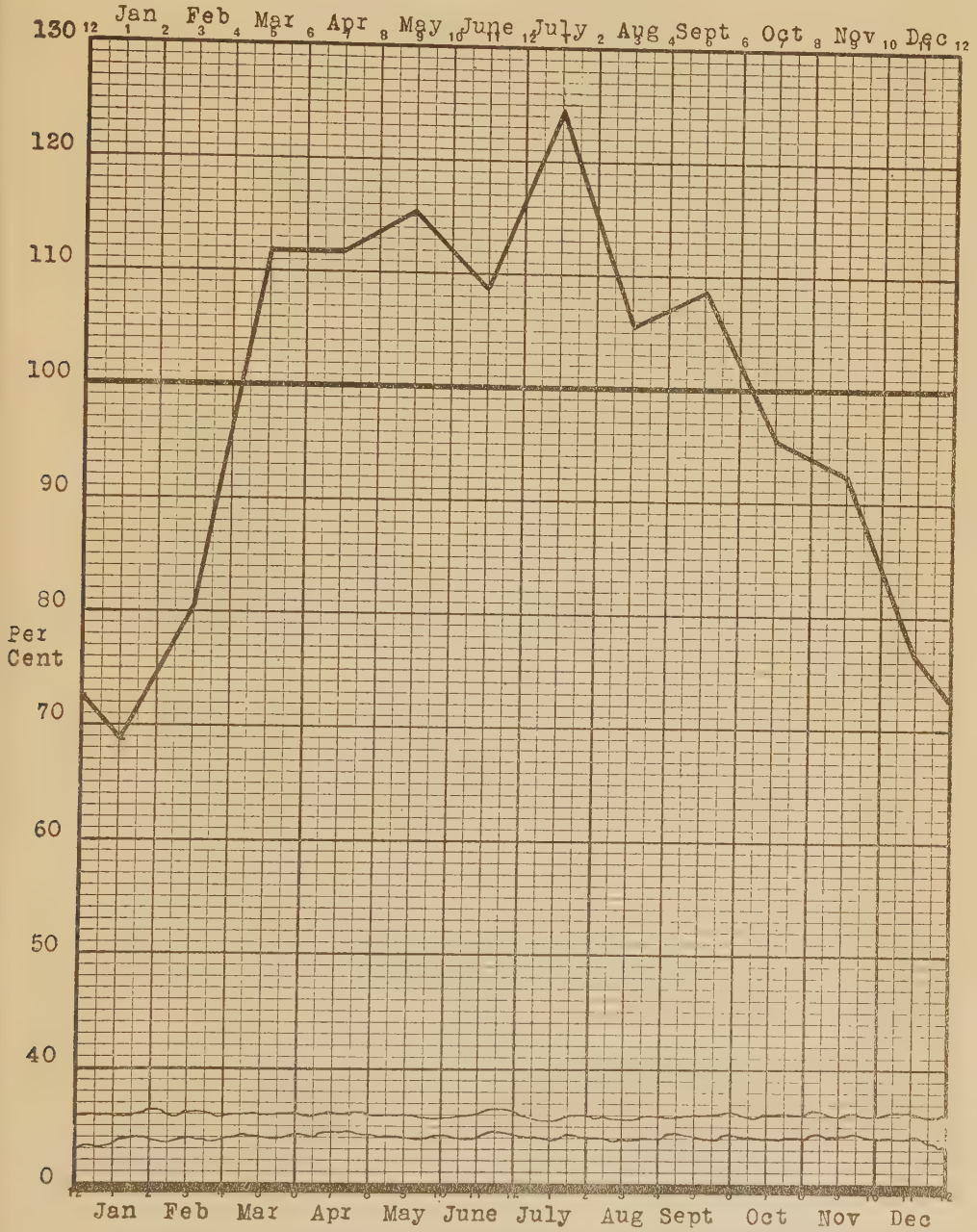
Actual and Deflated* Value
Source: F. W. Dodge Corporation



*Deflated by the general index of cost of construction for the
Pittsburg District compiled by the American Appraisal Co.
Trend Equation $y = 6.350 + .925x$

CHART XVI
SEASONAL VARIATION IN OHIO CONSTRUCTION CONTRACTS
1919-1925

Average Month = 100
(Average Ratio to Trend Method)
Source: F. W. Dodge Corporation



should be interpreted in the light of the above discussion.

The method employed is the average ratio to trend method. That is, the employment figure for each month of the year is expressed as a ratio to the trend figure for the corresponding month. All the January ratios for the period were then grouped and the median ratio was selected as an average. The same was done for February and each of the succeeding months. That the range of these ratios is large for each of the several months is shown in Table VIII. As further proof of the quite dissimilar character of the seasonal fluctuations from year to year, Table IX is presented, showing the different results secured from different methods for the period 1919-1924.

The Ohio Construction Cycle Since 1919

After corrections have been made for the seasonal movement, as shown in the preceding chart, and for the secular trend movement, shown in Chart VIII, the remaining cyclical and random fluctuations are represented in Chart XVII. The fact that the seasonal movement is very irregular has been pointed out in the above section. This cycle chart is a further reflection of this irregular seasonal movement, since the seasonal index used is merely an approximation. This inability to differentiate between the seasonal and the cyclical movement lessens the value of the cyclical chart, as far as accurate measurement is concerned.

OHIO CONSTRUCTION RECORDS

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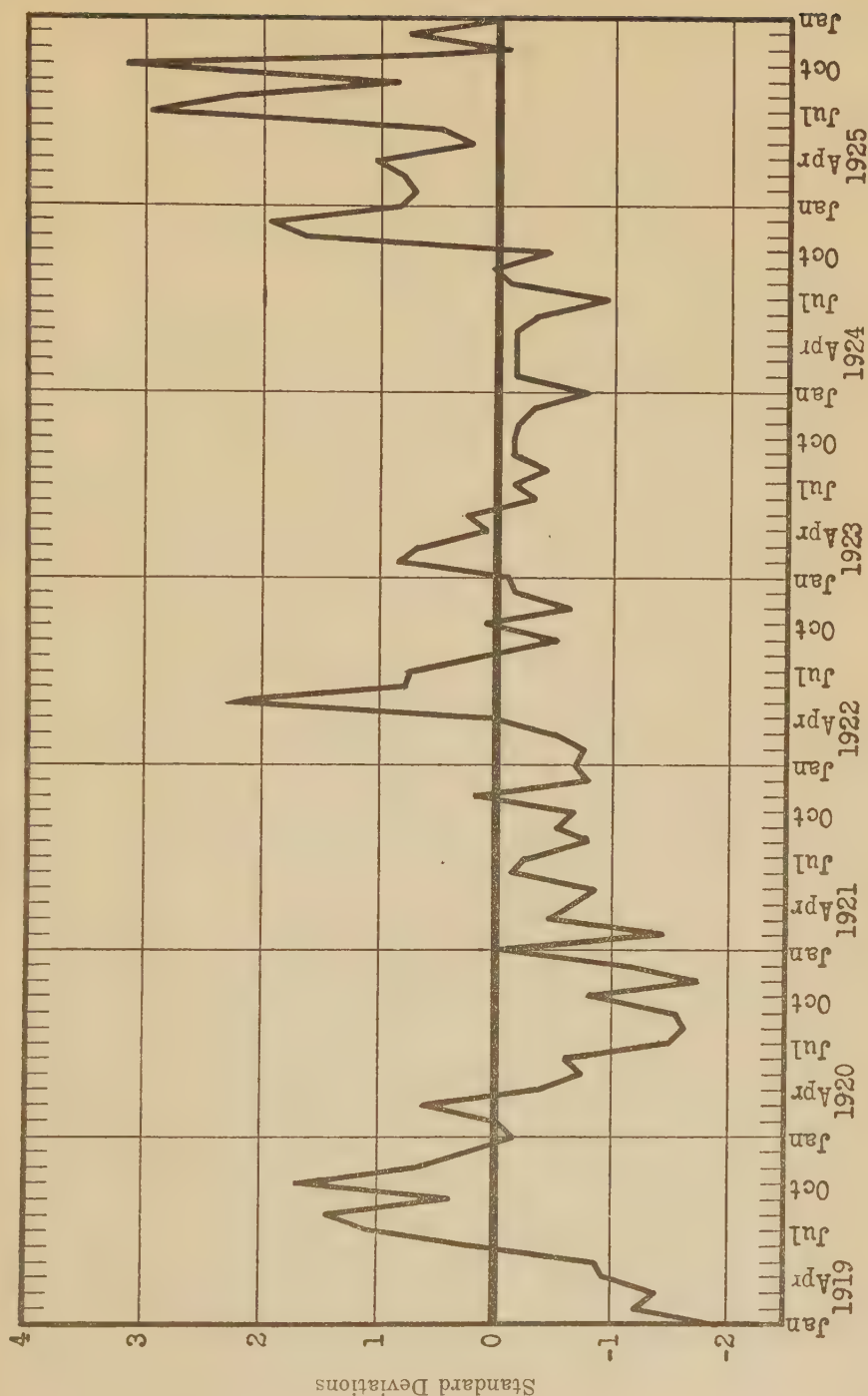
TABLE VIII
SEASONAL VARIATION IN OHIO CONSTRUCTION CONTRACTS
Average Ratio to Trend Method
Range of Relatives

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	22.9	40.1	57.4	75.4	81.2	87.4	60.7	46.5	49.5	70.9	36.5	45.6
	49.6	47.6	92.7	87.2	85.1	94.8	83.8	76.2	86.8	73.5	70.9	54.8
	53.5	58.5	93.2	98.8	83.9	95.9	115.0	89.5	89.7	80.2	87.7	67.6
	65.0	77.3	107.5	107.7	110.8	104.7	120.2	101.4	104.4	91.6	88.7	73.4
	67.1	80.1	138.3	114.4	121.0	116.9	158.3	108.9	111.2	98.5	99.3	83.9
	67.6	100.1	138.8	114.5	127.1	128.9	170.2	157.3	115.6	153.6	114.8	98.0
	68.4	107.1	143.2	153.9	207.7	138.4	252.2	186.2	140.0	199.7	140.5	127.7
Chronological Sequence of Relatives												
1919	22.9	47.6	57.4	75.4	81.2	116.9	170.2	157.3	115.6	153.6	114.8	83.9
1920	65.0	80.1	138.3	98.8	85.1	87.4	60.7	46.5	49.5	70.9	36.5	45.6
1921	67.6	40.1	93.2	87.2	83.9	104.7	115.0	76.2	89.7	73.5	99.3	54.8
1922	53.5	58.5	92.7	114.4	207.7	138.4	158.3	108.9	86.8	98.5	70.9	73.4
1923	67.1	107.1	138.8	114.5	127.1	95.9	120.2	89.5	104.4	91.6	87.7	67.6
1924	49.6	77.3	107.5	107.7	110.8	94.8	83.8	101.4	111.2	80.2	140.5	127.7
1925	88.6	100.1	143.2	153.9	121.0	128.9	252.2	186.2	140.0	199.7	88.7	98.0

TABLE IX
SEASONAL VARIATION IN OHIO CONSTRUCTION CONTRACTS AWARDED 1919-1924
Results Secured by Different Methods

Month	F. W. Dodge Corporation Index	Median Link Relatives Based on:		Median Link Relatives of 12 Month Moving Aver. Floor Space	Average Ratio to Trend			
					Medians		Arithmetic Means	
		Floor Space	Actual Values		Floor Space	Deflated Values	Floor Space	Deflated Values
Jan.	77	76	59	68	78	64	74	61
Feb.	84	94	83	83	77	72	79	74
March	131	136	123	131	130	110	129	114
April	132	123	117	121	122	111	118	108
May	130	121	123	123	110	114	117	117
June	108	105	114	101	109	120	104	111
July	93	93	128	117	97	143	100	133
August	90	90	94	91	89	104	99	106
Sept.	87	85	101	100	88	106	89	99
October	103	99	101	101	103	96	102	107
Nov.	92	93	86	88	115	89	100	92
Dec.	71	85	71	76	83	71	100	79

CONSTRUCTION CONTRACTS AWARDED IN OHIO BY MONTHS,
JANUARY, 1919.-JANUARY, 1926
CYCLICAL AND RANDOM FLUCTUATIONS*



*Based on Deflated Values

Standard Deviation = 34.3

CHAPTER III

THE INFLUENCE OF THE WEATHER ON THE CONSTRUCTION INDUSTRY IN OHIO

The Problem of Winter Construction

The elimination of waste in industry has recently become one of the chief concerns of the nation. The federal government has notably directed its energies to the solution of this problem, while industry itself, both privately and through organized agencies such as trades associations, has attempted to discover and weed out inefficient practices. It has long been recognized that highly fluctuating seasonal activity is a great economic evil. Highly seasonal activity results in losses due to unemployment of wage earners during a considerable period of the year and to feverish and inefficient activity during the peak periods of the year.

The construction industry is subject to greater seasonal fluctuations than any other of the major industries of the country. It is entirely natural that the construction industry should have become accustomed to intense activity during the warm months and to lull periods during the cold months, since construction is, to a considerable extent, an outdoor industry. The experiences of individual contractors, however, have led many to think that these seasonal peaks and troughs are the results of custom and are avoidable to an appreciable degree.

The Report of a Committee of the President's Conference on Unemployment

The President's Conference on Unemployment in 1921 developed great interest in the losses due to seasonal activity and, as a result, a committee was appointed by Secretary Hoover of the United States Department of Commerce to investigate the feasibility of eliminating the dull winter periods in the construction industry. The findings of this committee were published in "Seasonal Operation in the Construction Industries," (New York, 1924).

The report of this committee shows that seasonal activity is more the result of the customs and technique of an earlier period than of present necessity.¹ This study also points out very force-

¹*Seasonal Operation in the Construction Industries*, Summary p. xi.

fully the advantages of continuous activity in construction. This present study is in part an attempt to measure the factors in this problem for the State of Ohio.

Statement of the Problem

Object of the Study

The object of this particular section of this report is to determine the effect of the climatic factor on construction activity in the State of Ohio. Since the dull period in construction is the winter season, the problem practically narrows itself down to the question of the influence of cold weather and precipitation on outdoor activity in the construction industry.

The Records Available

Before this question can be answered intelligently, it becomes necessary to know what are the conditions of winter weather in Ohio. This suggests at once recourse to the records of the United States Weather Bureau for the State of Ohio. Since Construction is a daylight industry, it is necessary to know weather conditions for the daylight hours only. For the purposes of this study the hourly record of temperatures from seven A. M. to six P. M. for the months of November, December, January, February, and March for the sixteen year period, November, 1909, through March, 1925, has been transcribed from the official records of the United States Weather Bureau for the stations of Cleveland, Columbus, and Cincinnati. The hourly record of precipitation (rain, and sleet or snow in water equivalent) for the same stations was secured for all twelve months for the period November, 1909, through October, 1925. This period of observation is sufficiently long that the results can be used with a considerable degree of reliability.

Explanation of the Standards Used

Having secured the weather record for these stations, it then became necessary to set up certain standards as to what sort of weather would likely have constituted an interference with construction activity. Here the standards developed and used by the Committee on Seasonal Operation in the Construction Industries in their report, above referred to, have been employed.

As far as temperature is concerned, it is generally agreed that the freezing point is the vital temperature as far as outdoor building activity is concerned because of the effect of freezing on building mixtures which contain water, and on ground which must be

excavated, and because of the disagreeableness and suffering incident to outdoor work in freezing temperatures. But it is not sufficient to record merely the number of days during which freezing temperatures occurred. The intensity of the cold must be recognized. This has been done by setting up three classes of freezing days. This classification as developed by the Committee on Seasonal Operation in the Construction Industries is shown in the following quotation.²

"Class 1. Days on which the temperature fell below eighteen degrees at some time, or the maximum did not rise above twenty-four degrees at any time.

"Class 2. Lowest Temperature between eighteen and twenty-four degrees, inclusive, but the temperature reached or exceeded twenty-five degrees during the day.

"Class 3. Lowest temperature between twenty-five and thirty-two degrees, inclusive."

The significance of this classification is shown in the following quotation.³

"On the Class 1 days there is generally a pronounced slowing up of outdoor activity. Less progressive builders are apt to suspend concrete and masonry work while those having more advanced methods need to use a maximum degree of protection for men and materials. On Class 2 days, a much better chance of continuous work is afforded, but workmen may suffer, especially if exposed to high winds, and vigilance in the protection of materials against freezing is necessary. On Class 3 days, interference with the human factor is greatly lessened but some materials such as concrete in thin forms are still endangered."

The "day," as explained above, is the period from seven A. M. to six P. M., and the measurements are in the Fahrenheit scale. In this report the three classes of days have been termed, in order, "Coldest Winter Days," "Medium Cold Days," and "Moderately Cold Days."

With reference to the precipitation standards used, the following quotation indicates the main procedure:³

²*Seasonal Operation in the Construction Industries*, p. 13.

³Division of Building and Housing, United States Department of Commerce: *Weather and Construction*, pp. 6-7.

"It was a more difficult matter to fix the point at which precipitation would interfere with work It was finally determined to take the amount of precipitation which would force workmen to quit through personal discomfort as the critical point for use in these tables. After consultation with weather bureau officials and experienced builders this point was defined as .05 inches of rain per hour, per square foot, or its water equivalent in snow or sleet Some discretion had to be exercised in determining for what part of a day a given amount of precipitation would stop work. For instance, when a brief but heavy shower was indicated, it was assumed that workmen would remain at the job and that work would be resumed. When there was a heavy shower in the morning, and continuing lighter precipitation during the day, it was assumed that that day would be lost."

In this report, the procedure followed differs slightly in one respect from that described above for recording the precipitation factor, and that was in the direction of making the study entirely quantitative rather than discretionary. If the precipitation amounted to .05 inches per hour, it was assumed that work would be stopped during that hour. In case this amount of precipitation was followed in the immediately succeeding hours by a measurable amount of precipitation (i. e., .01 inches per hour or more), it was assumed that work would be stopped during the total number of such consecutive hours.

"It is to be remembered, of course, that local customs among workmen or employers may vary in regard to quitting work for the day on account of rain In dull times it is often the case that employers do not provide work on rainy days."⁴

With these standards in mind, the sixteen year hourly records of temperature and precipitation for the three stations were inspected for the occurrence of the described classes of freezing days in the months of November, December, January, February, and March and for the occurrence of the described amount of precipitation in all twelve months. The numbers of Class 1, 2, and 3 freezing days were totaled for each of the cold months and averages computed for each class for each of the cold months on the basis of the sixteen year observation. The total number of hours during which the critical amount of precipitation occurred (as described above) was computed for each of the seven warm months and each

⁴*Seasonal Operation in the Construction Industries*, p. 13.

total divided by eleven (the number of hours in the daily observation) to determine the day-equivalent of the total. The working day is not, of course, composed of eleven hours, but the working period may vary from year to year and between localities, and even from month to month when overtime is considered. For the five cold months two precipitation totals were computed, the first representing precipitation occurring on non-freezing days, and the second representing precipitation occurring on freezing days. This latter total is shown in the tables but is not shown on the charts, since such days are counted as freezing days. For the purposes of these calculations Sundays and the holidays regularly observed in the building trades in Ohio were excluded from the record, since the object is to determine the interference with building activity on working days.

It has been pointed out that the records of three stations were selected for this study. This selection was dictated primarily by the locations of these stations in the northern, central, and southern sections of the State and secondarily by the availability of the records over this sixteen year period. Because of the size and location of the State, there are no extreme variations in climatic conditions from section to section. The three stations used afford a representative selection and it is believed that their records may be used with a considerable degree of reliability to represent not only the cities themselves but also contiguous sections.

Climatic Interference with Construction, 1909-1925

Northern Ohio

The results for Northern Ohio are based on the sixteen year observation of the United States Weather Bureau station at Cleveland.

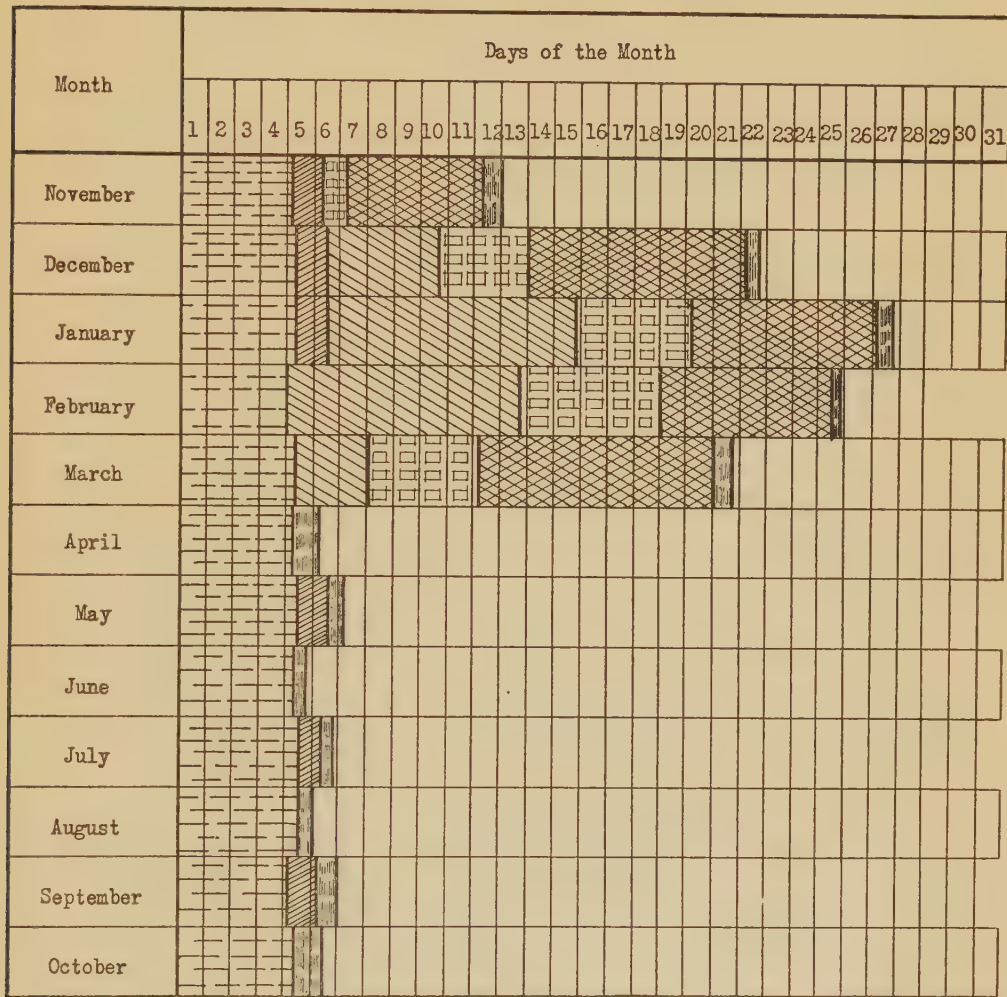
The Temperature Factor

Chart XVIII is an attempt to show in summary and graphic form the average interference with outdoor building activity in Northern Ohio and also to show the time accounted for by Sundays and holidays in order to permit a visual comparison to be made between the amount of the different types of interference and the average working period. The chart is adapted from similar charts used in the national study already referred to.

CHART XVIII

DISTRIBUTION OF TIME IN THE CONSTRUCTION INDUSTRY IN NORTHERN OHIO SHOWING NUMBER OF DAYS DURING WHICH PRECIPITATION AND FREEZING TEMPERATURE OCCURED DURING WORKING HOURS

November, 1909, to October, 1925
Source: U. S. Weather Bureau, Cleveland, Ohio



Sundays



Holidays



Precipitation
0.5 Inches Per
Hour or More



Free
Working
Days



Class I
Freezing Days
Coldest Days



Class II
Freezing Days
Medium Cold Days



Class III
Freezing Days
Moderately
Cold Days

The interference caused by low temperature in the months of January and February is greatest. The total number of freezing days is almost identical (21 for January and 20 for February), but January shows slightly more "coldest winter days" (9.4 and 8.8). The interference is also great in December, but the number of "coldest winter days" is considerably less (5.3). The interesting thing to note about the record for Northern Ohio is the small number of freezing days in November and the large number in February. This is especially striking when comparison is made with the similar record for Southern and Central Ohio. The explanation is clear; it is due to the tempering effect of Lake Erie on the climate of Cleveland, deferring the cold weather in November and prolonging it in March. While the number of freezing days in March is considerable (16.0), it will be observed that over one-half are only "moderately cold days" (8.9), and the number of "coldest winter days" is slight (2.8).

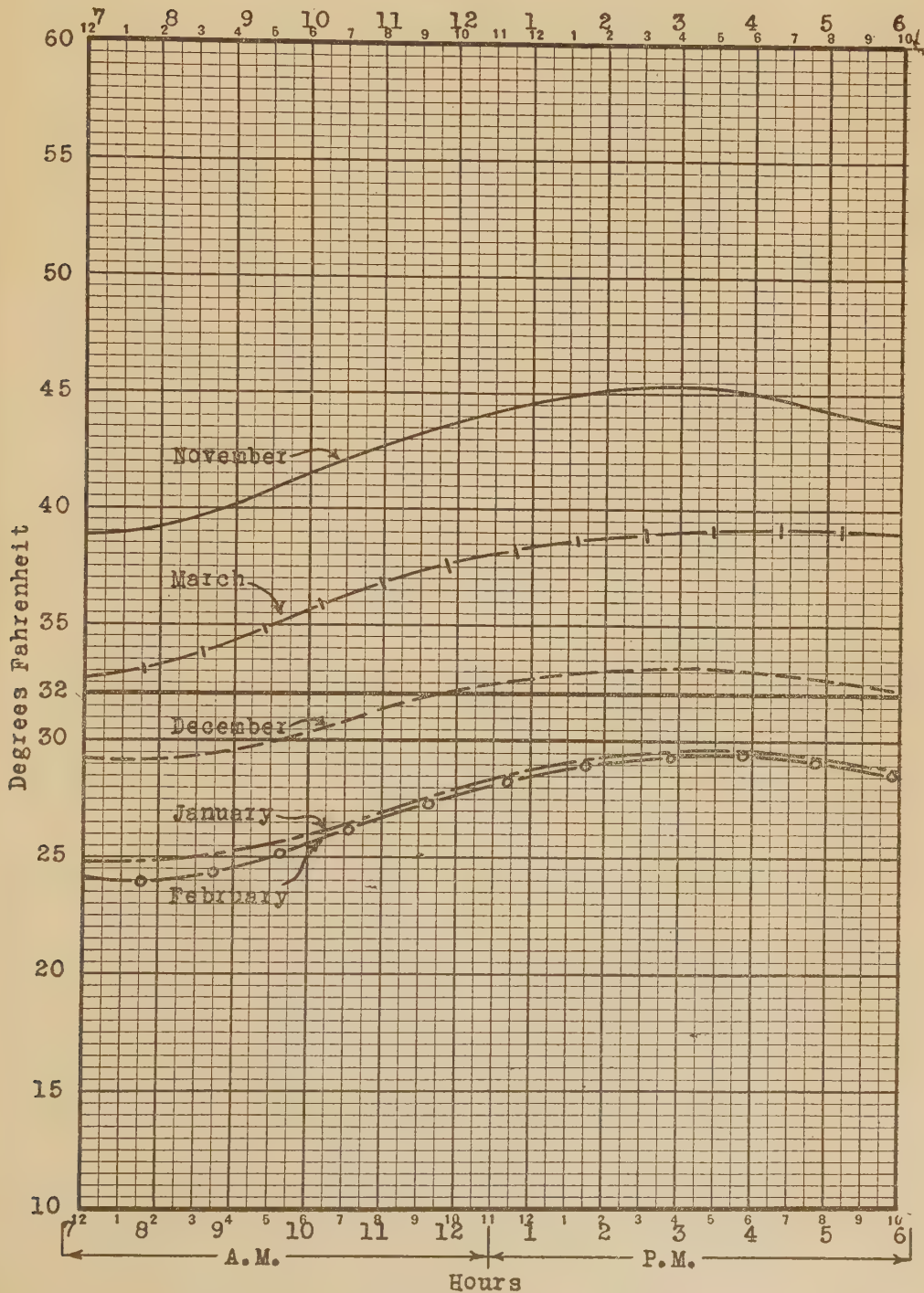
Chart XIX permits an even more ready comparison between the temperatures for the five months. On this chart are plotted the temperature curves for the five months, showing the average temperature for each of the five months, by hours from seven A. M. to six P. M. The critical point on the scale is, of course, the 32 degrees or freezing line. The average temperature is above 32 degrees throughout the day for March and November. For December the average is below freezing from seven A. M. through eleven A. M., and for January and February the average is consistently below the freezing point.

Precipitation

The method of determining the interference caused by precipitation has already been explained. Chart XVIII, referred to in the section above, also shows graphically the average interference due to precipitation. It will be seen readily that this is not a very disturbing factor. The interference is greatest in the months of April and October and is slight in those cases. Tables X and XI show the precipitation factor in another way. The purpose is to show the actual number of working days by months for the sixteen year period on which the critical amount of precipitation occurred between the hours of seven A. M. and six P. M., and the total number of hours during which the precipitation was recorded for each month. The averages shown on Table X are

CHART XIX MEAN MONTHLY TEMPERATURE BY HOURS IN NORTHERN OHIO 1909-1925

Source: U. S. Weather Bureau, Cleveland, Ohio
 Hours



THE CONSTRUCTION INDUSTRY IN OHIO

TABLE X
PRECIPITATION FACTOR—NORTHERN OHIO
NUMBER OF WORKING DAYS ON WHICH THE CRITICAL AMOUNT* OF PRECIPITATION OCCURRED
(Separate for Freezing and Non-freezing Days)

Year	November		December		January		February		March		April		May		June		July		Aug.		Sept.		Oct.	
	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days
1909	1	0	1	0	1	1	0	2	0	0	2	0	1	3	4	0	2	2	1	4	2	2	4	2
1910	2	1	1	0	3	1	2	0	1	0	5	0	3	4	4	0	4	2	4	6	3	3	4	4
1911	3	1	2	1	1	0	0	1	0	1	3	1	4	4	0	1	4	4	6	2	2	2	2	2
1912	1	0	0	0	3	1	0	1	0	0	4	0	2	2	1	5	2	2	1	3	3	7	7	7
1913	1	1	1	0	0	1	0	1	0	0	6	0	5	5	3	3	0	0	2	2	2	3	3	3
1914	0	0	2	0	0	1	0	0	0	1	1	1	4	4	5	3	0	3	0	0	2	2	1	1
1915	0	0	1	1	0	0	1	1	1	1	2	1	4	4	4	5	3	3	0	0	2	2	1	1
1916	2	0	1	0	2	0	0	0	0	1	2	1	4	4	5	3	2	2	0	0	2	2	3	3
1917	1	0	0	0	1	0	1	0	2	1	4	0	4	4	3	3	3	3	4	4	1	1	7	7
1918	2	0	0	0	0	0	2	0	0	3	2	0	3	3	2	2	2	2	3	3	5	5	2	2
1919	4	0	0	0	1	0	0	0	1	1	6	0	4	4	3	6	2	2	3	3	5	5	6	6
1920	2	1	1	0	0	0	0	0	0	1	9	0	1	1	6	4	0	0	4	4	2	2	4	4
1921	3	0	2	0	0	0	1	0	2	5	3	2	2	2	4	4	4	4	3	3	4	4	7	7
1922	0	0	1	3	1	1	0	0	0	5	0	3	3	3	1	1	1	2	3	3	2	2	3	3
1923	5	0	4	1	0	1	0	0	1	1	3	0	3	3	3	3	1	1	3	3	3	2	2	2
1924	2	0	1	2	2	1	0	1	0	1	4	0	4	4	5	5	3	3	2	2	5	5	0	0
1925	—	—	—	—	0	1	3	1	2	0	1	0	1	1	3	3	8	8	1	1	3	3	3	3
Av. No. of Days	1.8	.3	1.1	.5	.9	.5	.6	.4	1.8	.4	3.6	3.0	3.0	3.3	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.5	3.5

* .05 inches per hour or more.

TABLE XI
PRECIPITATION FACTOR—NORTHERN OHIO
NUMBER OF WORKING HOURS DURING WHICH CRITICAL AMOUNT* OF PRECIPITATION WAS RECORDED
(Separate for Freezing and Non-freezing Days)

Year	November		December		January		February		March		April	May	June	July	Aug.	Sept.	Oct.
	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days							
1909	3	0	3	0	2	8	11	0	0	0	7	4	8	4	1	9	22
1910	6	2	3	0	12	9	0	0	0	1	19	6	9	4	15	13	17
1911	11	4	4	1	4	0	0	0	0	3	18	12	0	9	10	2	7
1912	1	0	0	0	10	6	0	1	13	0	21	8	2	4	1	6	19
1913	2	11	2	0	0	5	0	0	9	0	29	16	16	0	8	5	4
1914	0	0	4	0	0	0	0	0	3	5	1	9	5	6	0	3	7
1915	0	0	3	6	0	0	1	0	3	2	5	13	13	3	0	6	14
1916	8	0	1	0	4	0	0	0	6	4	13	9	4	7	14	2	22
1917	0	3	0	0	9	0	0	1	6	0	7	4	2	4	8	14	6
1918	10	0	0	0	0	0	0	6	4	3	12	7	4	6	9	11	32
1919	10	0	0	0	8	0	0	0	4	3	12	7	4	6	10	7	19
1920	5	3	4	0	0	0	0	0	2	0	30	7	16	0	11	8	13
1921	22	0	5	0	0	0	9	0	16	10	8	3	6	10	6	7	7
1922	0	0	4	19	1	7	0	0	27	0	7	14	3	4	9	10	11
1923	12	0	12	9	0	6	0	0	3	0	9	9	10	1	9	3	0
1924	6	0	2	13	4	3	0	2	3	0	14	11	12	9	3	13	0
1925					0	7	5	9	4	0	5	1	7	16	1	10	21
Total	96	23	47	48	54	51	23	30	99	28	205	133	117	87	106	126	221
Av. No. of Hours Per Mo.	6.0	1.4	3.0	3.0	3.4	3.2	1.5	1.9	6.2	1.8	12.9	8.3	7.3	5.5	6.6	7.9	13.8
Av. No. of Hours Per Day†	3.3	5.8	2.6	6.0	3.6	6.4	2.3	4.3	3.3	4.0	3.5	2.8	2.3	2.2	2.7	2.6	4.0

* .05 inches per hour or more.

† Average duration of precipitation recorded. See Table X for number of days.

pessimistic, since it is unusual for the whole day to be lost because of rain. However, even these averages show that the precipitation factor is not very disturbing. The significant averages are shown in the last row of both tables. The averages in Table X show the average number of days for each month on which the critical precipitation was recorded while the last row of averages in Table XI shows the average duration of the precipitation recorded for each month. For example, Table X shows that the critical amount of precipitation occurred in November on slightly less than two days on the average, and Table XI shows that the average duration of this precipitation was slightly over three hours. Thus the average expectancy for November is three hours of interference on each of two days.

The detailed record for the sixteen year period is shown in Table XII permitting a ready comparison between different years and between the averages and individual years. It must not be understood from this discussion of weather interference that building activity ceases on freezing and rainy days. On such days the weather is more or less a serious deterrent to work, but progressive builders no longer suspend operations on such days. Rather they continue their operations, but adapt their methods by providing protection to men and materials. This will be treated in more detail in a later section, but this word of caution is necessary here. The weather averages introduced in this section show quantitatively what conditions must be dealt with by builders who schedule their operations throughout the year.

Central Ohio

The results for Central Ohio are based on the sixteen year observation of the United States Weather Bureau Station at Columbus.

The Temperature Factor

The accompanying chart (No. XX) affords a graphic picture of the average interference with outdoor activity in Central Ohio during the sixteen years. A glance shows that the average interference is greatest during the months of January and February. January shows the largest number of freezing working days (19.7) and also the largest number of "Coldest Winter Days" (7.6). February is a close second with 18.3 freezing working days and

TABLE
WEATHER INTERFERENCE
NORTHERN

Number of Working Days on Which the Described

Year	Total Freezing Days					November					December					Ja	
	Nov.	Dec.	Jan.	Feb.	Mar.	Class			Precipitation		Class			Precipitation		Class	
						1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2
1909	4	21	—	—	—	0	0	4	.27	.00	13	3	5	.27	.00	—	—
1910	9	26	22	23	12	0	0	9	.55	.18	9	9	8	.27	.00	7	5
1911	11	13	18	18	21	1	1	9	1.00	.36	2	2	9	.36	.09	6	7
1912	5	16	25	22	24	0	0	5	.09	.00	3	2	11	.00	.00	21	1
1913	4	12	16	22	13	0	3	1	.18	1.00	0	2	10	.18	.00	2	7
1914	10	18	16	23	17	0	5	5	.00	.00	9	3	6	.36	.00	3	2
1915	6	22	23	16	23	0	1	5	.00	.00	2	4	16	.27	.55	9	4
1916	9	18	15	25	22	0	3	6	.73	.00	8	4	6	.09	.00	8	2
1917	9	18	22	22	17	0	2	7	.00	.27	12	2	4	.00	.00	11	3
1918	5	7	26	16	12	0	1	4	.91	.00	0	2	5	.00	.00	22	4
1919	7	24	18	19	15	0	0	7	.91	.00	12	3	9	.00	.00	6	1
1920	6	14	25	23	10	0	1	5	.45	.27	2	4	8	.36	.00	16	5
1921	1	20	16	21	10	0	0	1	2.00	.00	2	4	14	.45	.00	6	6
1922	5	18	24	18	14	0	1	4	.00	.00	4	8	6	.36	1.73	11	5
1923	3	7	24	22	19	0	0	3	1.09	.00	0	1	6	1.09	.82	2	6
1924	9	20	20	24	16	0	3	6	.55	.00	6	6	8	.18	1.18	10	6
1925	—	—	26	16	11	—	—	—	—	—	—	—	—	—	—	10	8
Av. No. of Days	6.4	17.1	21	20.6	16	.1	1.3	5.1	.55	.13	5.3	3.7	8.2	.27	.27	9.3	4.5

*Precipitation (rain, snow, or sleet in water content) of .05 inches per hour or more.

†Classes of freezing days:

Class 1 (Coldest winter days)—lowest temperature below 18° F. and highest temperature not above 24° F.

Class 2 (Medium cold days)—lowest temperature above 18° F. during the day but temperature reached or exceeded 25° F.

Class 3 (Moderately cold days)—lowest temperature during the day between 25° and 32° F.

XII
WITH OUTDOOR ACTIVITY
N OHIO

Precipitation* and Freezing Temperature† Occurred

January			February					March					Apr.	May	June	July	Aug.	Sept.	Oct.
Precipitation			Class			Precipitation		Class			Precipitation		Precipitation						
Warm Days	Cold Days		1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days							
3																			
	.18	.73	12	4	7	.00	1.00	1	1	10	.00	.00	.64	.36	.73	.36	.09	.73	2.00
	1.09	.73	4	7	7	.45	.00	2	6	13	.00	.09	1.73	.55	.82	.36	1.36	1.18	1.55
	.36	.00	14	4	4	.00	.09	5	8	11	.00	.27	1.64	1.09	.00	.82	.91	.18	.64
	.91	.55	12	3	7	.00	.09	3	6	4	1.18	.00	1.91	.73	.18	.36	.09	.55	1.73
	.00	.45	14	5	4	.00	.00	5	5	7	.82	.00	2.64	1.45	1.45	.00	.73	.45	.36
	.00	.00	5	4	7	.18	.09	1	10	12	.27	.45	.09	.82	.45	.55	.00	.27	.64
	.36	.00	13	6	6	.00	.00	11	5	6	.27	.18	.45	1.18	1.18	.27	.00	.55	1.27
	.82	.00	11	6	5	.09	.00	2	3	12	.55	.36	1.18	.82	.36	.64	1.27	.18	2.00
	.00	.00	9	5	2	.55	.00	0	5	7	.55	.00	.64	.36	.18	.36	.73	1.27	.55
	.73	.00	3	7	9	.00	.00	1	3	11	.36	.27	1.09	.64	.36	.55	.82	1.00	2.91
	.00	.00	8	6	9	.00	.00	4	2	4	.18	.00	2.73	.64	1.45	.00	.91	.64	1.73
	.00	.00	2	6	13	.00	.82	0	2	8	1.45	.91	.73	.27	.55	.91	1.00	.73	1.18
	.09	.64	5	6	7	.00	.00	0	5	9	2.45	.00	.64	1.27	.27	.36	.55	.64	.64
	.00	.55	13	4	5	.00	.00	7	5	7	.27	.00	.82	.82	.91	.09	.82	.91	1.00
	.36	.27	10	8	6	.00	.18	0	4	12	.27	.00	1.27	1.00	1.09	.82	.27	1.18	.00
	.00	.64	5	4	7	.82	.45	2	0	9	.36	.00	.45	.09	.64	1.45	.09	.91	1.91
1	.31	.29	8.8	5.3	6.6	.13	.17	2.8	4.4	8.9	.56	.16	1.17	.76	.66	.49	.60	.71	1.26

CHART XX

DISTRIBUTION OF TIME IN THE CONSTRUCTION INDUSTRY IN CENTRAL OHIO SHOWING NUMBER OF DAYS DURING WHICH PRECIPITATION AND FREEZING TEMPERATURE OCCURED DURING WORKING HOURS

November, 1909, to October, 1925

Source: U. S. Weather Bureau, Columbus, Ohio

Month	Days of the Month																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
November																																
December																																
January																																
February																																
March																																
April																																
May																																
June																																
July																																
August																																
September																																
October																																

Sundays

Holidays

Precipitation
.05 Inches per
Hour or More

Free
Working
Days

Class I
Freezing Days
Coldest Days

Class II
Freezing Days
Medium Cold Days

Class III
Freezing Days
Moderately
Cold Days

6.6 "Coldest Winter Days." Excluding Sundays, holidays and "precipitation days," the freezing days in January and February constitute practically the same per cent of the remainder, 79 per cent in the case of January and 78 per cent in the case of February. The number of "Medium Cold Days" and "Moderately Cold Days" is about the same for January and February. Practically, there is little difference between the two months.

In December the total average number of freezing working days (17.1) does not vary greatly from January and February, but there are slightly fewer "Medium Cold Days" (4.1) and "Coldest Winter Days" (5.4).

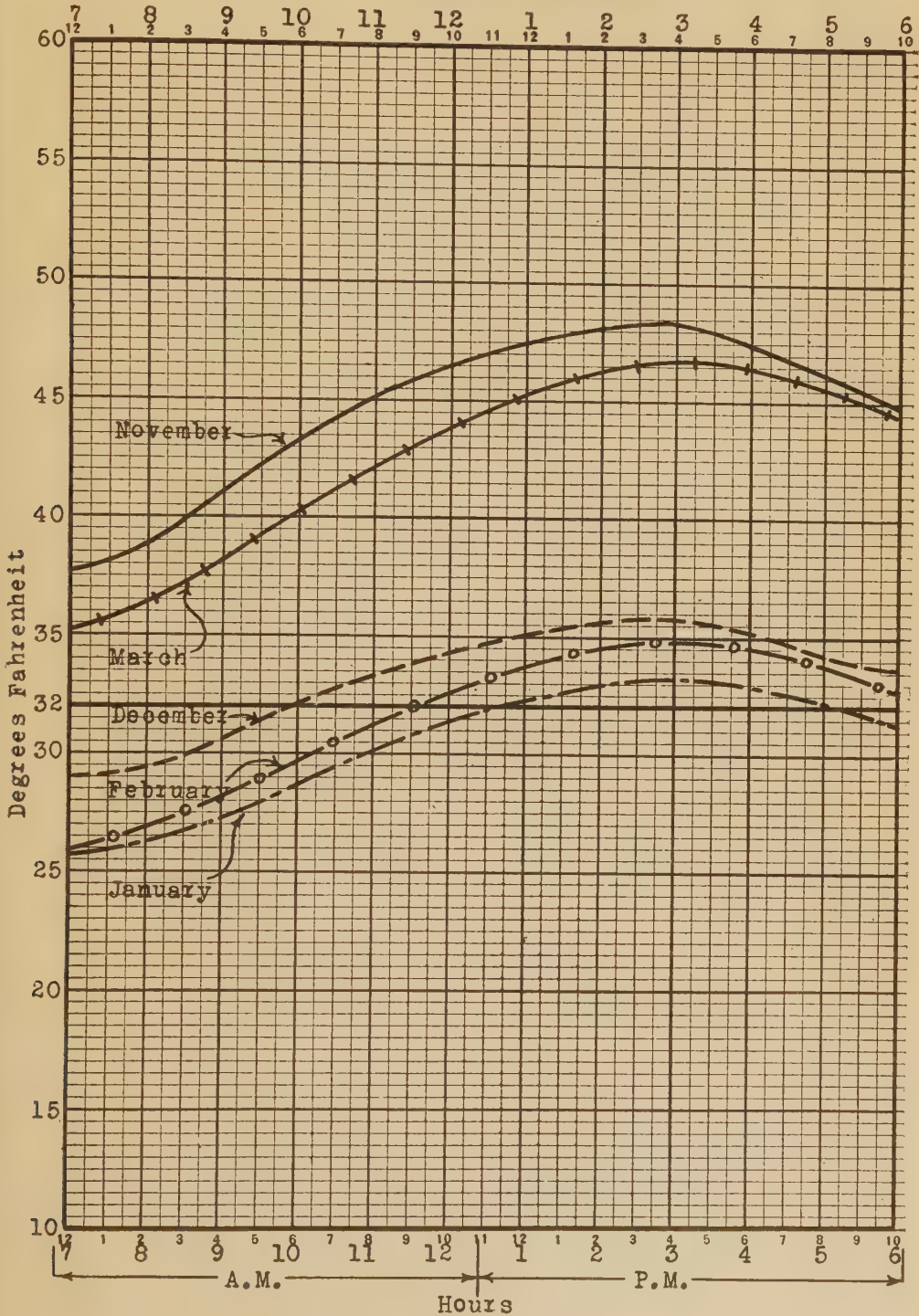
In March the average number of freezing working days is considerable (12.3), but a glance at the chart is sufficient to show that most of these are only "Moderately Cold Days" (8.0). The total average number of "Coldest Winter Days" (1.6) and "Medium Cold Days" (2.6) is only 4.3.

As it would be expected, the chart shows November to be a very mild month. The total average number of freezing working days is only 7.8, and 5.8 of these days are only "Moderately Cold Days." The number of "Coldest Winter Days" is negligible (.3), while the number of "Medium Cold Days" is only 1.7.

Chart XXI presents the temperature record for Central Ohio in a different manner. It shows the average temperature by hours for each of the five cold months from seven A. M. to six P. M. Experience and common observation show that the coldest hour of the typical winter day is close to seven A. M. and the warmest hour is about the middle of the afternoon. It is interesting to note the number of hours on which the average temperature is at or below the freezing point; four in December, seven in January, and five in February. The chart shows that there are no normal freezing hours from seven A. M. to six P. M. in November and March in Central Ohio. It should be pointed out, however, that further refinement of the data would probably show normal freezing temperatures for the last few days in November. This could be determined, of course, by determining the average temperature by hours for each day of the month. In December the normal temperature is at or below the freezing point from seven to ten A. M.; in January from seven A. M. to twelve noon and again at

CHART XXI MEAN MONTHLY TEMPERATURE BY HOURS IN CENTRAL OHIO 1909-1925

Source: U. S. Weather Bureau, Columbus, Ohio



six P. M.; in February from seven to eleven A. M. It can also be seen that in January the normal temperature is never far from the freezing point.

The average for each hour is the arithmetic mean of the recorded temperatures for that hour. Since they are based on a sixteen year observation period, they should constitute fairly reliable averages. The dispersion about the averages for seven A. M., twelve noon, and six P. M. for each month has been computed mathematically. It has not been judged necessary to make these computations for each hour. The three selected hours, representing the beginning, middle and closing hour of the day, afford a fair sample. The reliability of the averages for these three hours are indicative of the reliability of all the averages. Table XIII shows the arithmetic means, the Standard Deviations, and the Probable Errors for the hours indicated. The meaning of these measures of dispersion is fairly simple. It will be readily understood that all the actual temperatures will not coincide with the arithmetic mean, but will be distributed above and below the mean. The significance of the standard deviation is that approximately two-thirds of the actual temperatures will lie within a range of one standard deviation above and below the mean. (In the case of November, 7 A. M., by actual count, 66.88 per cent of the temperatures lies within this range.) The significance of the probable error is that approximately one-half of the temperatures will lie within a range of one probable error above and below the mean. When used for planning purposes, it may be said that the chances are approximately even that the actual temperatures for a given hour of a given month will not vary by more than one probable error above and below the arithmetic mean for that hour. It will be noted from the table that the probable errors vary from six to nine degrees.

TABLE
WEATHER INTERFERENCE
CENTRA

Number of Working Days on Which the Described

Year	Total Freezing Days					November					December					Ja	
						Class			Precipitation		Class			Precipitation		Class	
	Nov.	Dec.	Jan.	Feb.	Mar.	1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2
1909	6	23	—	—	—	0	0	6	.00	.00	12	6	5	.27	.00	—	—
1910	14	24	17	21	6	0	1	13	.00	.00	6	11	7	1.82	.00	6	7
1911	11	10	17	14	16	1	0	10	.82	.09	2	2	6	2.91	.00	6	5
1912	9	16	23	22	17	0	0	9	.18	.00	3	3	10	.27	.36	13	8
1913	5	15	14	18	12	0	3	2	1.91	.00	0	5	10	.00	.00	0	7
1914	10	18	14	22	16	1	5	4	.09	.00	8	6	4	.91	.09	3	1
1915	6	20	23	14	20	0	1	5	.09	.00	2	6	12	.55	.00	8	4
1916	7	20	14	23	17	1	2	4	1.64	.00	10	1	9	.27	.00	7	3
1917	10	18	22	21	10	1	2	7	.00	.00	14	3	1	.00	.00	8	3
1918	8	10	27	15	8	0	1	7	.45	.00	0	3	7	.91	.00	20	4
1919	7	23	17	18	11	0	3	4	2.55	.00	12	4	7	.00	.27	4	2
1920	6	14	24	19	10	0	2	4	1.27	.45	3	3	8	.00	.00	14	6
1921	2	17	16	15	4	0	1	1	2.09	.00	1	4	12	1.09	.00	7	2
1922	7	16	23	15	10	0	2	4	.36	.00	4	4	8	1.00	.00	11	6
1923	7	10	19	19	18	0	0	7	.45	.00	0	2	8	.55	.73	1	5
1924	10	19	20	21	11	0	4	6	1.00	.00	9	3	7	.55	.00	9	7
1925	—	—	25	15	10	—	—	—	—	—	—	—	—	—	—	5	7
Av. No. of Days	7.8	17.1	19.7	18.3	12.3	.3	1.8	5.8	.81	.03	5.4	4.1	7.6	.69	.09	7.6	4.8

*Precipitation (rain, snow, or sleet in water content) of .05 inches per hour or more.

†Classes of freezing days:

Class 1 (Coldest winter days)—lowest temperature below 18° F. and highest temperature not above 24° F.

Class 2 (Medium cold days)—lowest temperature above 18° F. during the day but temperature reached or exceeded 25° F.

Class 3 (Moderately cold days)—lowest temperature during the day between 25° and 32° F.

XIV
 WITH OUTDOOR ACTIVITY
 L OHIO
 Precipitation* and Freezing Temperature† Occurred

January			February					March					Apr.	May	June	July	Aug.	Sept.	Oct.
Precipitation			Class			Precipitation		Class			Precipitation								
3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days							
Precipitation																			
4	1.27	.09	10	5	6	.00	3.00	0	1	5	.00	.00	.64	1.82	1.27	.91	.00	1.18	1.82
6	.55	.27	3	5	6	.18	.00	2	2	12	.09	.64	2.36	.27	.64	.00	.09	1.36	1.73
2	.00	.00	11	4	7	.00	.27	4	3	10	.55	.09	2.55	.73	.09	1.18	.91	.64	.36
7	3.09	.00	11	1	6	.55	.00	2	4	6	2.00	.00	2.64	.36	.45	.82	.55	.55	1.00
0	.64	.18	14	4	4	.27	.36	2	6	8	.36	.09	1.36	.36	.55	.91	1.18	.73	3.00
1	.00	.00	1	6	7	1.00	.00	0	6	14	.00	.82	.36	1.27	.45	.91	1.55	.81	.18
4	.64	.18	10	5	8	.00	.55	7	3	7	.91	.27	1.00	1.36	1.18	.27	.73	1.00	.18
1	.00	.55	8	2	11	.36	.09	2	1	7	.45	.55	1.64	1.55	1.55	.45	.64	.18	1.00
3	.00	.27	7	2	6	.55	.00	0	1	7	1.36	.00	.55	.64	.27	.45	1.82	1.18	.64
1	.45	.00	2	5	11	.45	.00	0	2	9	1.45	.00	.91	1.09	.45	.91	.64	.82	3.64
4	.00	.64	4	6	9	.55	.00	3	2	5	1.09	.00	2.91	.91	1.00	.82	1.73	1.00	1.00
7	.45	.00	1	3	11	1.18	.00	0	2	2	3.18	.45	1.27	1.09	.55	1.00	.73	.73	.27
6	.36	.00	3	8	4	.55	.18	0	3	7	1.45	.00	1.09	1.36	.55	.27	.36	.18	.36
3	.36	.00	10	4	5	1.00	.18	2	3	13	.27	.00	1.82	.91	1.45	.55	.82	.91	1.00
4	1.18	.00	6	8	7	.00	.55	0	3	8	.27	.00	1.73	.82	.45	.36	.27	1.18	.18
3	.00	.00	4	4	7	.55	.00	2	0	8	.45	.00	.27	.09	.91	1.00	1.00	.27	1.82
7.3	.51	.14	6.6	4.5	7.2	.50	.14	1.6	2.6	8.0	.74	.18	1.44	.90	.74	.68	.81	.80	.97

TABLE XIII

MEASURES OF THE DISPERSION ABOUT THE TEMPERATURE
AVERAGES FOR CENTRAL OHIO

Observation Period: Nov., 1909-Oct., 1925

Month	Hour	Standard Deviation	Probable Error
November	7 A. M.	9.53°F.	6.43°F.
November	12 M.	10.89	7.35
November	6 P. M.	10.27	6.93
December	7 A. M.	12.45	8.40
December	12 M.	11.67	7.87
December	6 P. M.	11.07	7.47
January	7 A. M.	12.67	8.55
January	12 M.	12.18	8.22
January	6 P. M.	12.04	8.12
February	7 A. M.	12.36	8.34
February	12 M.	11.98	8.08
February	6 P. M.	12.01	8.10
March	7 A. M.	11.24	7.58
March	12 M.	13.31	8.98
March	6 P. M.	13.19	8.90

Precipitation

The chart shows clearly that the average interference with outdoor activity in Central Ohio by precipitation is very slight. The average number of days during which construction would probably have been interfered with (in accordance with the described standards) is less than one in all months except April, in which case the number is 1.4. It should be pointed out that interference by precipitation during the freezing days of the five cold months is not shown on the chart, since such days are counted among the freezing days. The inclusion of these days would not, however, have brought the total to one in any case.

Table XIV presents in detail the record for the sixteen-year observation period, showing the number of the three classes of freezing days and the calculated number of days during which the critical amount of precipitation occurred in each year. In order to show the precipitation factor in a slightly different manner, Tables XV and XVI are introduced. These tables show the actual number of working days by months for the sixteen year

THE CONSTRUCTION INDUSTRY IN OHIO

TABLE XV
PRECIPITATION FACTOR—CENTRAL OHIO
NUMBER OF WORKING DAYS ON WHICH THE CRITICAL AMOUNT* OF PRECIPITATION OCCURRED
(Separate for Freezing and Non-freezing Days)

Year	November		December		January		February		March		April	May	June	July	Aug.	Sept.	Oct.
	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days							
1909	0	0	0	2	2	1	0	4	0	0	3	4	3	4	0	4	3
1910	0	0	3	0	2	1	1	0	1	1	5	2	3	1	6	5	3
1911	2	1	7	0	0	0	1	0	2	1	6	4	1	6	4	2	2
1912	1	0	2	2	0	0	1	0	4	0	7	2	3	3	1	3	3
1913	5	0	0	0	7	0	1	0	2	1	4	3	3	4	4	3	8
1914	1	0	3	2	1	1	2	2	2	1	4	3	4	5	5	3	1
1915	1	0	1	0	0	0	3	0	0	1	3	3	4	3	4	5	1
1916	3	0	1	0	4	1	1	0	2	3	3	4	6	3	4	4	1
1917	0	0	0	0	0	1	1	1	1	2	5	6	7	2	5	1	4
1918	2	0	3	0	1	0	3	0	3	0	2	5	2	3	6	4	2
1919	5	0	0	1	1	0	3	0	3	0	2	3	2	2	3	3	8
1920	2	1	0	0	0	2	2	0	4	0	6	3	6	6	6	3	4
1921	6	0	3	0	1	0	4	0	9	1	5	5	3	6	4	4	2
1922	2	0	4	0	2	0	2	1	4	0	5	7	3	2	3	1	2
1923	1	0	3	1	2	0	2	0	1	0	5	3	5	4	5	4	3
1924	2	0	3	0	2	0	0	1	2	0	4	4	3	2	1	2	1
1925	—	—	—	—	0	0	3	0	1	0	1	1	4	5	4	2	4
Av. No. of Days	2.1	.1	2.1	.5	1.6	.4	1.8	.6	2.4	.6	4.1	3.7	3.6	3.6	3.8	3.1	3.2

* .05 inches per hour or more.

TABLE XVI

PRECIPITATION FACTOR—CENTRAL OHIO
NUMBER OF WORKING HOURS DURING WHICH CRITICAL AMOUNT* OF PRECIPITATION WAS RECORDED
 (Separate for Freezing and Non-freezing Days)

Year	November		December		January		February		March		April	May	June	July	Aug.	Sept.	Oct.
	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days							
1909	0	0	0	2	14	1	0	33	0	0	7	20	14	9	0	13	20
1910	0	0	20	0	6	3	2	0	1	7	26	3	8	1	15	19	11
1911	9	1	32	0	0	0	0	3	6	1	28	8	1	13	10	7	4
1912	2	0	3	4	0	0	6	0	22	0	26	4	5	9	6	6	11
1913	21	0	0	0	34	0	0	0	4	1	15	4	6	10	13	8	33
1914	1	0	10	2	7	2	3	4	4	1	4	14	5	10	17	10	2
1915	1	0	6	0	0	0	11	0	0	9	4	14	5	10	17	10	2
1916	18	0	3	0	7	2	0	6	10	3	11	15	13	3	8	11	2
1917	0	0	0	0	0	6	4	1	5	6	18	17	17	5	7	2	11
1918	5	0	10	0	0	3	6	0	15	0	6	7	3	5	20	13	7
1919	28	0	0	3	5	0	5	0	16	0	10	12	5	10	7	9	40
1920	14	5	0	0	0	7	6	0	12	0	32	9	11	9	19	11	11
1921	23	0	12	0	5	0	13	0	35	5	14	12	6	11	8	8	3
1922	4	0	11	0	4	0	6	2	16	0	12	15	6	3	4	2	4
1923	5	0	6	8	4	0	11	2	3	0	20	10	16	6	9	10	11
1924	11	0	6	0	13	0	0	6	3	0	19	9	5	4	3	13	2
1925	—	—	—	—	0	0	6	0	5	0	3	1	10	14	11	3	20
Total	142	6	119	19	99	24	79	57	153	32	251	160	131	122	157	145	192
Av. No. of Hrs. per Mo.	8.9	.4	7.4	1.2	6.2	1.5	4.9	3.5	9.6	2.0	15.7	10.0	8.2	7.6	9.8	9.1	12.0
Av. No. of Hrs. per Day†	4.3	3.0	3.6	2.4	4.0	3.4	2.7	6.3	3.9	3.2	3.8	2.7	2.3	2.1	2.6	2.9	3.8

* .05 inches per hour or more.

† Average duration of precipitation recorded. See Table XV for number of days.

WEATHER INFLUENCE

period on which the critical amount of precipitation occurred between the hours of seven A. M. and six P. M. and the total number of hours during which the precipitation continued. The significance of these tables was described above under the discussion of the precipitation factor for Northern Ohio.

Southern Ohio

The results for Southern Ohio are based on the sixteen year observation of the United States Weather Bureau Station at Cincinnati.

The Temperature Factor

Chart XXII shows the record for Southern Ohio. In the main essentials, there is little difference between this and the chart for Central Ohio. It is very clearly seen that the greatest interference takes place in the months of January and February. The total number of freezing days is greatest in January (18.1), but the February total is only slightly less (16.9). When Sundays, holidays, and "precipitation days" are excluded, it is found that the freezing days in January constitute 72.8 per cent of the remainder; the corresponding figure for February is 71.9 per cent. The difference between the two months is primarily due to the greater number of "Coldest Winter Days" in January (6.3 compared with 5.0 for February). December shows a total of 16.0 freezing days, and 7.6 of these are only "Moderately Cold Days" while only 4.2 are "Coldest Winter Days." The March record for Southern Ohio shows 11.2 freezing days but most of these are "Moderately Cold Days" (7.6). The average number of "Coldest Winter Days" is only 1.3. The total average number of freezing days in November is 7.1 and 5.4 of these are "Moderately Cold Days." As was pointed out in the case of Central Ohio, the average number of "Coldest Winter Days" in November is negligible, (.3). It will be observed that the interference with outdoor activity by low temperature in Southern Ohio is slightly less than in Central Ohio for all five of the cold months.

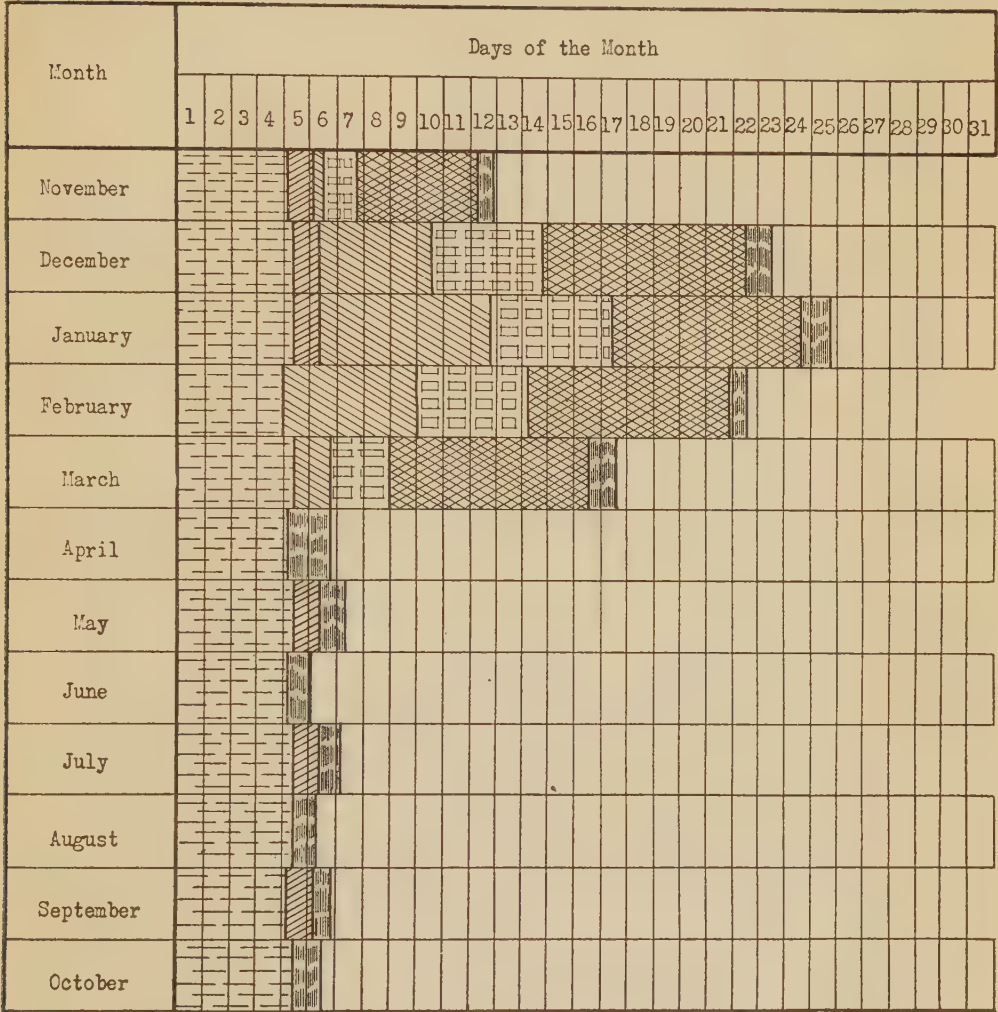
Chart XXIII shows the average temperature by hours in Southern Ohio for each of the five cold months from seven A. M. to six P. M. These averages reflect much better than the previous charts the difference in temperature conditions between Central and Southern Ohio. It will be observed that the averages for Southern Ohio are always above the averages for Central Ohio.

CHART XXII

DISTRIBUTION OF TIME IN THE CONSTRUCTION INDUSTRY IN SOUTHERN SHOWING NUMBER OF DAYS DURING WHICH PRECIPITATION AND FREEZING TEMPERATURE OCCURED DURING WORKING HOURS

November, 1909, to October, 1925

Source: U. S. Weather Bureau, Cincinnati, Ohio



Sundays



Holidays



Precipitation
0.5 Inches per
Hour or More



Free
Working
Days



Class I
Freezing Days
Coldest Days



Class II
Freezing Days
Medium Cold Days



Class III
Freezing Days
Moderately
Cold Days

CHART XXIII
 MEAN MONTHLY TEMPERATURE BY HOURS IN SOUTHERN OHIO
 1909-1925

Source: U. S. Weather Bureau, Cincinnati, Ohio

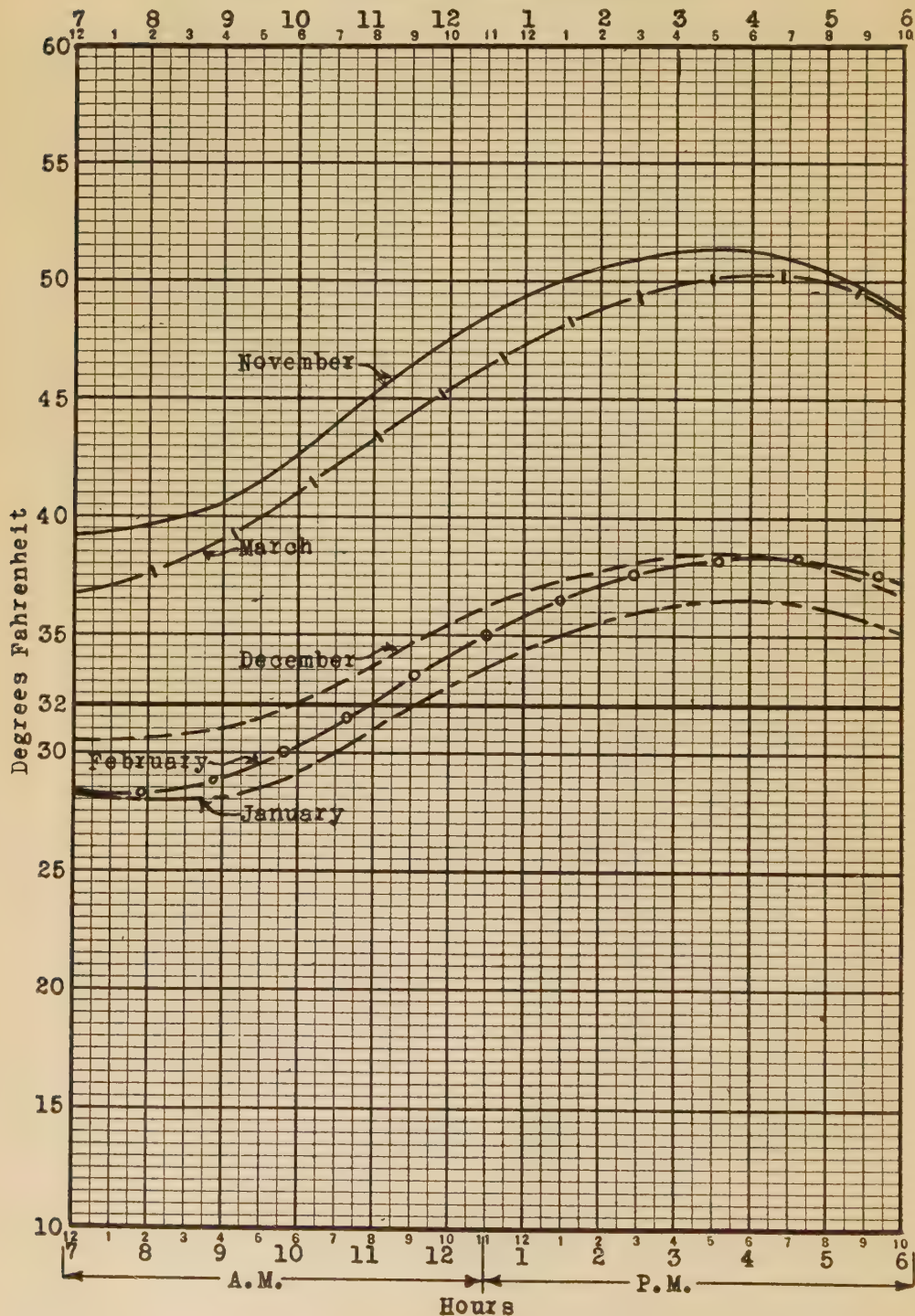


TABLE X
WEATHER INTERFERENCE W
SOUTHERN

Number of Working Days on Which the Described P

Year	Total Freezing Days					November					December					January		
	Nov.	Dec.	Jan.	Feb.	Mar.	Class			Precipitation		Class			Precipitation		Class		
						1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2	3
1909	4	22	—	—	—	0	0	4	.09	0	9	7	6	.00	.27	—	—	—
1910	10	20	15	18	6	0	0	10	.09	0	1	14	4	1.82	.00	9	2	7
1911	10	11	17	12	10	1	2	7	.73	0	1	2	8	2.55	.00	3	7	7
1912	5	14	23	22	15	0	0	5	.36	0	2	3	9	.64	.00	12	6	5
1913	4	15	12	16	10	0	1	3	1.64	0	0	2	13	.27	.00	0	2	10
1914	9	17	11	21	14	1	5	3	.00	0	6	5	6	.45	.00	2	1	8
1915	8	19	19	10	16	0	2	6	.64	0	1	6	12	.73	.18	5	5	9
1916	6	17	12	22	15	1	3	2	1.00	0	8	3	6	.36	.64	9	1	2
1917	9	18	19	18	11	1	1	7	.00	0	14	2	2	.00	.73	7	4	8
1918	7	9	25	14	10	0	2	5	.45	0	1	2	6	1.00	.00	20	3	2
1919	7	23	17	17	14	0	3	4	2.91	0	12	3	8	.00	.55	3	4	10
1920	7	15	22	19	10	1	1	5	1.36	0	2	3	10	.27	.45	8	7	7
1921	4	15	16	14	5	0	0	4	1.91	0	0	3	12	1.36	.27	2	9	5
1922	9	16	22	14	9	0	1	8	.55	0	3	5	8	2.00	.00	8	8	6
1923	5	9	17	18	13	0	0	5	.00	0	0	2	7	1.95	.55	1	4	12
1924	9	16	20	22	13	0	1	8	.18	0	7	5	4	.09	.00	8	5	7
1925	—	—	22	14	8	—	—	—	—	—	—	—	—	—	—	4	7	11
Av. No. of Days	7.1	16.0	18.1	16.9	11.2	.3	1.4	5.4	.74	0	4.2	4.2	7.6	.84	.23	6.3	4.7	7.

*Precipitation (rain, snow, or sleet in water content) of .05 inches per hour or more.

†Classes of freezing days:

Class 1 (Coldest winter days)—lowest temperature below 18° F. and highest temperature not above 24° F.

Class 2 (Medium cold days)—lowest temperature above 18° F. during the day but temperature reached or exceeded 25° F.

Class 3 (Moderately cold days)—lowest temperature during the day between 25° and 32° F.

VII
TH OUTDOOR ACTIVITY
OHIO

precipitation* and Freezing Temperature† Occurred

January		February					March					Apr.	May	June	July	Aug.	Sept.	Oct.
Precipitation		Class			Precipitation		Class			Precipitation		Precipitation						
Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days							
1.73	.00	8	4	6	.00	.91	0	1	5	.09	.00	.27	1.00	1.73	1.09	.00	.73	2.09
.00	.36	0	5	7	.00	.00	1	0	9	.82	.00	2.00	.18	1.09	.82	1.18	1.82	1.36
.00	.09	9	6	7	.36	.64	3	3	9	.91	.00	2.09	1.45	1.00	.91	.91	.00	.73
3.73	.09	8	4	4	.64	.27	2	2	6	1.64	.00	2.64	.27	.45	.82	.55	.27	1.36
.55	.00	11	4	6	.73	.36	1	5	8	1.00	.00	1.73	1.00	.82	.73	1.64	.91	2.55
1.09	1.18	0	3	7	.82	.00	0	2	14	.00	.00	.45	1.00	1.55	.73	2.00	.64	.64
1.91	.00	9	4	9	.00	.09	6	5	4	.27	.55	.36	1.45	1.27	.55	.91	.73	.00
.36	.18	8	1	9	.36	.00	2	1	8	.45	.82	2.00	.82	.82	1.00	.55	.18	.91
.00	1.09	5	3	6	.82	.00	0	2	8	1.55	.00	.55	.82	.73	.55	1.00	1.09	1.00
.36	.00	2	4	11	.27	.27	0	3	11	1.00	.45	1.73	1.09	1.00	.36	.00	1.09	1.45
.00	1.00	3	4	12	.00	.00	2	2	6	1.36	.00	3.36	1.27	.45	1.09	.64	1.18	.82
.00	.27	1	4	9	1.09	.00	0	1	4	1.27	.27	.91	1.36	.82	1.09	.73	.36	.55
.18	.00	2	7	5	1.00	.00	0	2	7	1.55	.18	1.55	.55	.82	.00	1.64	.18	.73
.55	.09	7	6	6	.45	.27	2	4	7	.27	.00	1.91	1.00	.82	.45	.09	.55	.55
1.36	.36	5	5	12	.00	.73	0	2	11	.45	.73	1.27	1.91	.73	.55	.36	.45	.27
.18	.00	2	5	7	.45	.00	2	1	5	.00	.46	.91	.18	.91	1.64	1.18	.09	2.45
.81	.29	5.0	4.3	7.6	.44	.22	1.3	2.3	7.6	.79	.22	1.48	.96	.94	.77	.84	.64	1.09

The chart shows that in Southern Ohio the normal temperature is at or below the freezing point from seven to ten A. M. in December, from seven to eleven A. M. in January, and from seven to eleven A. M. in February.

Precipitation

Again, it can be readily seen from the chart that precipitation is not a very significant interfering factor. The maximum calculated number of days on which the critical amount of precipitation occurred is 1.5 for the month of April, October ranking second with 1.1 days. December and January would show about the same number if the precipitation on freezing days were shown. It will be observed that the precipitation factor is slightly greater in Southern Ohio than in Central Ohio.

The detailed record by years for Southern Ohio is shown in Table XVII. Reference to this table will show for each year the number of freezing days of the three classes and also the calculated number of days during which the critical amount of precipitation occurred. Tables XVIII and XIX show the actual number of working days by months for the sixteen year period on which the precipitation amounted to .05 inches per hour or more and the total number of hours during which the precipitation continued.

Comparison Tables

Comparative weather conditions in the three sections of the State are shown in Tables XX and XX-A.

TABLE XVIII
PRECIPITATION FACTOR—SOUTHERN OHIO
NUMBER OF WORKING DAYS ON WHICH THE CRITICAL AMOUNT* OF PRECIPITATION OCCURRED
(Separate for Freezing and Non-freezing Days)

Year	November		December		January		February		March		April	May	June	July	Aug.	Sept.	Oct.
	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days							
1909	3	0	0	1	4	0	0	3	1	0	2	4	5	4	0	3	4
1910	1	0	2	—	3	1	0	0	2	0	7	1	5	4	6	5	5
1911	2	0	6	0	0	1	1	2	3	0	5	6	4	6	5	0	2
1912	1	0	2	0	7	1	2	1	3	0	5	2	2	5	3	3	4
1913	4	0	1	0	7	1	2	1	3	0	5	2	2	4	4	1	5
1914	0	0	1	0	1	0	2	1	1	0	5	5	3	5	7	3	4
1915	2	0	1	1	3	2	2	0	0	0	3	5	5	4	4	3	2
1916	3	0	2	2	6	0	0	1	2	1	1	4	3	5	4	3	0
1917	0	0	0	2	2	1	1	0	1	3	4	3	5	3	3	1	4
1918	2	0	3	0	0	3	3	0	4	0	8	2	3	3	3	3	3
1919	5	0	0	1	1	0	2	1	3	1	5	2	3	2	0	5	7
1920	3	0	1	1	0	3	0	0	1	0	8	2	3	5	3	5	2
1921	7	0	2	1	0	1	4	0	4	1	7	3	3	6	3	2	3
1922	1	0	4	0	1	0	3	0	6	1	5	5	4	0	3	1	2
1923	0	0	4	1	1	1	2	1	1	0	4	4	4	0	6	4	2
1924	1	0	1	0	2	1	0	1	2	2	2	5	3	4	1	2	2
1925	—	—	—	—	1	0	2	0	3	0	4	2	5	8	7	1	5
Av. No. of Days	2.2	0	1.9	.6	2.0	.9	1.5	.7	2.4	.6	4.1	3.7	3.8	4.2	3.6	2.6	3.2

* .05 inches per hour or more.

SEASONAL EMPLOYMENT

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TABLE XIX
PRECIPITATION FACTOR—SOUTHERN OHIO
NUMBER OF WORKING HOURS DURING WHICH CRITICAL AMOUNT* OF PRECIPITATION WAS RECORDED
(Separate for Freezing and Non-freezing Days)

Year	November		December		January		February		March		April	May	June	July	Aug.	Sept.	Oct.
	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days	Warm Days	Cold Days							
1909	7	0	0	3	18	0	0	10	1	0	3	17	19	12	0	8	23
1910	1	0	20	0	11	4	0	0	9	0	22	2	12	9	13	20	14
1911	8	0	28	0	0	1	4	7	10	0	23	16	11	10	10	0	8
1912	4	0	7	0	0	1	7	3	18	0	28	3	5	9	6	3	15
1913	18	0	3	0	41	0	9	4	11	0	19	11	9	8	18	10	28
1914	0	0	5	0	6	0	9	4	0	0	5	11	17	8	21	7	7
1915	7	0	8	2	12	13	9	0	0	0	4	16	14	6	10	8	0
1916	11	0	4	7	21	0	0	1	3	6	22	9	9	11	6	2	10
1917	0	0	0	8	4	2	4	0	5	9	6	9	8	6	11	12	11
1918	5	0	11	0	0	12	9	0	17	0	19	12	11	8	0	12	16
1919	32	0	0	6	4	0	3	3	11	5	37	14	5	12	7	13	9
1920	15	0	3	5	0	11	0	0	15	0	10	15	9	12	8	4	6
1921	21	0	15	3	0	3	12	0	14	3	30	17	9	0	18	2	8
1922	6	0	22	0	2	0	11	0	17	2	21	6	9	5	1	6	6
1923	0	0	21	6	6	1	5	3	3	0	14	21	8	6	4	5	3
1924	2	0	1	0	15	4	0	8	5	8	10	2	10	17	13	1	27
1925					2	0	5	0	5	0	10	2	165	139	146	113	191
Total	137	0	148	40	142	52	78	39	144	33	260	175	165	189	146	113	191
Av. No. of Hrs. per Mo.																	
	8.6	0	9.3	2.5	8.9	3.3	4.9	2.4	9.0	2.1	16.3	11.0	10.3	8.7	9.1	7.1	12.0
Av. No. of Hrs. per Day†																	
	3.9	0	4.9	4.0	4.4	3.5	3.3	3.5	3.7	3.7	4.0	3.0	2.8	2.1	2.6	2.7	3.8

*.05 inches per hour or more.

† Average duration of precipitation recorded. See Table XVIII for number of days.

TABLE XX-A
 AVERAGE MONTHLY TEMPERATURE BY HOURS
 Observation Period: Nov., 1909-Oct., 1925; Fahrenheit Scale
 Source: U. S. Weather Bureau

Hour	November			December			January			February			March		
	Cleve- land	Colum- bus	Cincin- nati	Cleve- land	Colum- bus	Cincin- nati	Cleve- land	Colum- bus	Cincin- nati	Cleve- land	Colum- bus	Cincin- nati	Cleve- land	Colum- bus	Cincin- nati
7 A. M.....	39.0	37.8	39.2	29.2	29.0	30.5	24.7	25.9	28.0	24.0	26.0	28.3	32.7	35.2	37.0
8 A. M.....	39.1	38.9	39.6	29.2	29.4	30.8	24.7	26.2	28.0	23.9	26.9	28.4	33.1	36.5	37.7
9 A. M.....	40.2	41.1	40.5	29.5	30.6	30.9	25.1	27.4	28.0	24.6	28.1	28.8	34.5	38.5	39.0
10 A. M.....	41.5	43.1	42.8	30.4	32.0	32.1	25.9	28.9	29.3	25.8	29.8	30.4	35.8	40.5	41.2
11 A. M.....	42.8	45.1	45.3	31.4	33.4	33.7	27.0	30.4	31.1	26.8	31.4	32.2	36.9	42.3	43.4
12 M.....	43.9	46.4	47.8	32.2	34.3	35.6	28.0	31.4	33.0	27.9	32.7	34.2	37.7	43.9	45.6
1 P. M.....	44.7	47.4	49.4	32.8	35.1	36.9	28.7	32.3	34.4	28.7	33.8	36.0	38.3	45.2	47.4
2 P. M.....	45.1	48.2	50.6	33.1	35.6	37.9	29.3	33.0	35.6	29.2	34.6	37.1	38.8	46.2	49.0
3 P. M.....	45.2	48.4	51.3	33.2	35.8	38.4	29.6	33.5	36.3	29.5	35.0	38.1	39.1	46.8	50.0
4 P. M.....	45.03	47.3	51.3	32.8	35.3	38.5	29.6	33.0	36.7	29.5	34.7	38.5	39.3	46.5	50.2
5 P. M.....	44.4	46.2	50.4	32.6	34.5	37.9	29.1	32.2	36.1	29.2	33.9	38.2	39.2	45.8	50.0
6 P. M.....	43.7	45.0	49.0	32.2	33.7	36.9	28.6	31.5	35.0	28.7	33.0	37.2	38.9	44.4	48.9

TABLE
COMPARATIVE WEATHER
NORTHERN, CENTRAL,
Average Number of Working Days on Which the Described
(Average based on

Section	Total Freezing Days					November					December					January	
	Nov.	Dec.	Jan.	Feb.	Mar.	Class			Precipitation		Class			Precipitation		Class	
						1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2
Northern Ohio	6.4	17.1	21.0	20.6	16.0	.1	1.3	5.1	.55	.13	5.3	3.7	8.2	.27	.27	9.4	4.5
Central Ohio	7.8	17.1	19.7	18.3	12.3	.3	1.8	5.8	.81	.03	5.4	4.1	7.6	.69	.09	7.6	4.8
Southern Ohio	7.1	16.0	18.1	16.9	11.2	.3	1.4	5.4	.74	.00	4.2	4.2	7.6	.84	.23	6.3	4.7

*Precipitation (rain, snow, or sleet in water content) of .05 inches per hour or more.

†Classes of freezing days:

Class 1 (Coldest winter days)—lowest temperature below 18° F. and highest temperature not above 24° F.

Class 2 (Medium cold days)—lowest temperature above 18° F. during the day but temperature reached or exceeded 25° F.

Class 3 (Moderately cold days)—lowest temperature during the day between 25° and 32° F.

XX
 HER CONDITIONS
 ND SOUTHERN OHIO
 Precipitation* and Freezing Temperature† Occurred
 (period 1909-1925)

January			February						March						Apr.	May	June	July	Aug.	Sept.	Oct.
Precipitation			Class			Precipitation		Class			Precipitation		Precipitation								
3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days	1	2	3	Warm Days	Cold Days									
7.1	.31	.29	8.8	5.3	6.6	.13	.17	2.8	4.4	8.9	.56	.16	1.17	.76	.66	.49	.60	.71	1.26		
7.3	.51	.14	6.6	4.5	7.2	.50	.14	1.6	2.6	8.0	.74	.18	1.44	.90	.74	.68	.81	.80	.97		
7.1	.81	.29	5.0	4.3	7.6	.44	.22	1.3	2.3	7.6	.79	.22	1.48	.96	.94	.77	.84	.64	1.09		

CHAPTER IV

SEASONAL EMPLOYMENT IN THE CONSTRUCTION INDUSTRY IN OHIO—1914-1924

The fact of highly fluctuating seasonal activity in the construction industry has already been pointed out. It is a matter of common observation that the cold months of the year constitute a very dull season in building and that activity is normally at a high level during the warmer months. The object of this particular section of this report is to supply an accurate measurement of seasonal activity in the construction industry in Ohio.

The best gauge of the amount of activity in the building industry from month to month is the amount of employment. Fortunately there is available a very complete record of employment by months in the various groups of the construction industry in the State of Ohio from 1914 to 1924, inclusive. The Division of Labor Statistics of the Department of Industrial Relations of the State of Ohio since 1914 has received at the close of each year obligatory reports from the employers¹ of the State, which reports, among other things, show the number of wage earners² employed on the 15th of each month of the year, classified according to industries. The construction industry is listed as a separate industry and the reports are complete for the group as a whole and for twelve³ sub-groups of the industry.

This information is given for the entire State⁴ and for the chief counties. For the purposes of this analysis, the record has been secured over this period for the State and for the seven largest counties, Cuyahoga, Franklin, Hamilton, Lucas, Mahoning, Montgomery, and Summit. Because of the relative importance of the large cities in these counties, the record practically reflects conditions in these large cities. These cities are, in the order of the counties named: Cleveland, Columbus, Cincinnati, Toledo, Youngs-

¹Only a few establishments normally employing less than five persons are included in the reports.

²Separate reports are made for wage earners, clerical workers and salespeople. Only the wage earner group is important in the construction industry.

³The groups are: All construction; brick, stone, and cement work; electrical contracting; erecting and installing machinery (since 1917); painting and decorating; plastering, including lathing; plumbing and steam fitting; sand and gravel excavating; sheet metal work and roofing; street, road, and sewer contracting; and ventilating and heating.

town, Dayton and Akron.

The data for the State and the seven principal counties have been subjected to statistical analysis for the purpose of determining the normal seasonal variation in the employment of wage earners in the construction industry. This normal variation has been computed for the entire eleven-year period, 1914-1924 inclusive, and also for the earlier (1914-1918) and later (1919-1924) halves of this period. The purpose of this division of the period is to ascertain whether any change has taken place in the normal seasonal variation since the war period.

The State

The advantages of winter construction have been given considerable publicity within recent years and there is a current notion that the seasonal employment curve has been smoothed out to a considerable extent. At the appropriate places, the actual changes which the record shows will be pointed out.

All Construction Industries

In order to point out the fairly regular seasonal fluctuation in employment in the Ohio Construction Industry, Table XXI and Chart XXIV are presented. The "All Construction" data represent all of the construction industries combined. The manner of computing these indices of employment requires some explanation.

The employment data used are not strictly comparable from year to year. "There has been no significant change in the form

⁴The Industrial Commission of Ohio, Bulletin, Vol. II, No. 4, page 164, (Columbus 1915). The table heading is explanatory: "Table IV.—Fluctuation in Number of Wage Earners Employed, by Industries." (The first section of this table represents data for the State and the second for each of the 20 counties having a population of 50,000 or over in 1910. For the State every industry is shown for which three or more establishments reported and 200 or more wage earners are represented, and for each of the counties indicated every industry is shown for which three or more establishments reported and 100 or more wage earners are represented. The manufacturing industries are grouped alphabetically under sub-groups for the State, and alphabetically under the general groups 'Manufacturers,' and without sub-groups for each of the 20 counties.)"

From 1923 on the method of reporting is shown by the table heading in the report for that year, Vol. IV, No. 2, page 314: "Table IV. Fluctuation in Number of Wage Earners Employed, by Industries. (The first Section of this table presents data for the State and the second Section for each of the 23 counties having a population of 50,000 or over in 1920. For the State, and each of the counties indicated, every industry is shown for which three or more establishments reported and 100 or more wage earners are represented and for each of the counties indicated, every industry is shown for which three or more establishments reported and 50 or more wage earners are represented.)"

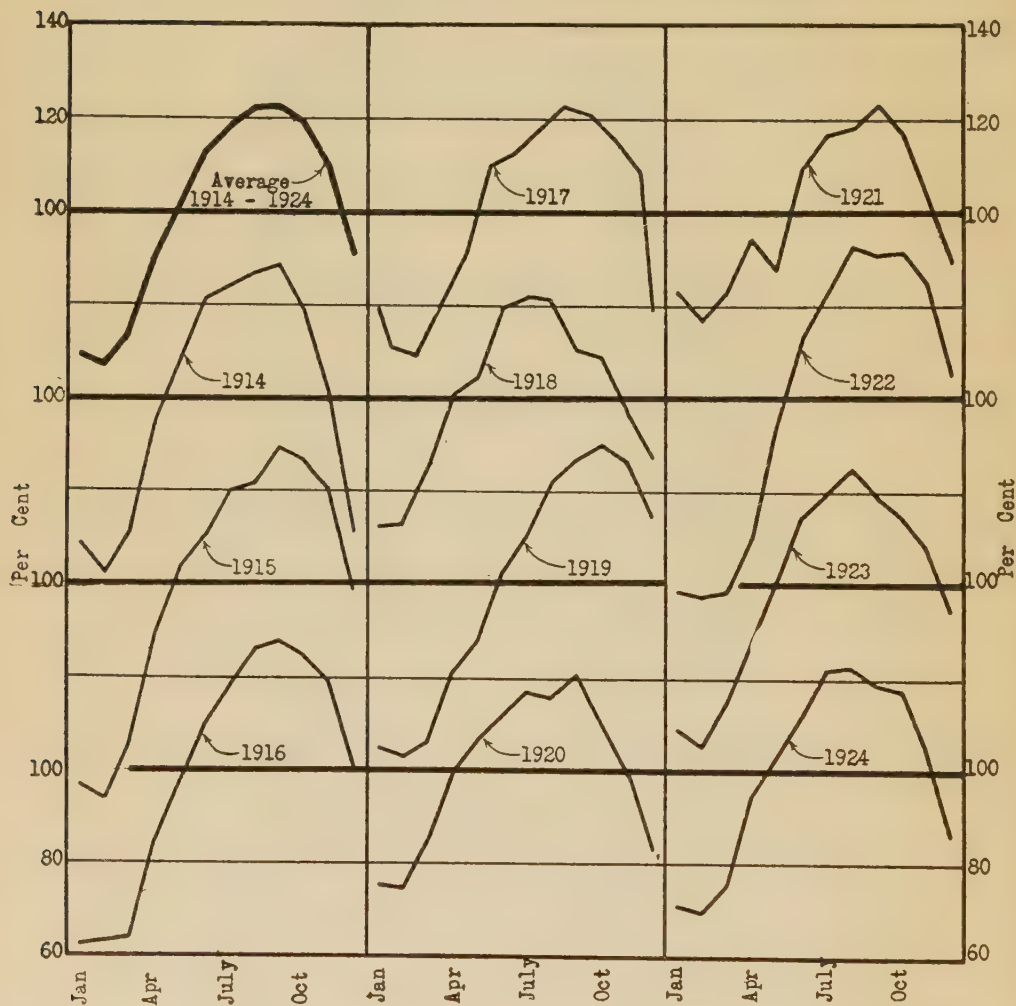
TABLE XXI
SEASONAL VARIATION IN EMPLOYMENT
ALL CONSTRUCTION—STATE OF OHIO
Average Month in Each Year = 100

Year	Jan.	Feb.	Mar.	April	May	June	July	August	Sept.	October	Nov.	Dec.
1914	69.3	62.5	71.1	95.4	109.2	121.8	124.2	126.7	128.7	118.8	101.2	71.2
1915	56.3	53.9	67.0	89.9	104.9	110.4	119.8	122.3	129.5	126.8	120.3	99.0
1916	62.6	63.3	63.8	85.1	98.5	110.1	118.5	126.6	127.3	125.3	118.5	100.2
1917	71.8	69.4	78.7	90.6	110.0	113.9	118.4	122.8	120.7	115.9	108.3	79.4
1918	72.1	72.1	85.1	101.0	104.1	119.2	122.0	121.4	110.5	109.1	96.9	86.5
1919	65.7	62.9	66.6	81.7	88.4	103.6	111.4	122.3	127.3	129.7	126.2	114.2
1920	75.9	74.5	85.5	99.0	106.5	112.5	117.0	115.9	121.3	111.2	98.6	82.1
1921	83.8	76.2	82.3	94.7	87.9	109.9	116.5	117.8	122.2	117.7	102.4	88.7
1922	58.4	57.9	58.4	71.5	94.2	112.5	122.3	133.1	130.9	131.3	124.0	105.4
1923	69.6	65.8	74.6	88.6	101.7	114.9	120.0	125.5	119.7	115.7	109.4	94.5
1924	70.9	69.8	75.9	95.2	103.6	111.9	121.8	122.1	119.7	117.9	105.3	86.0
Average	68.8	66.2	73.5	90.2	100.8	112.8	119.2	123.3	123.4	119.9	110.1	91.6

CHART XXIV SEASONAL VARIATION IN EMPLOYMENT IN THE OHIO CONSTRUCTION INDUSTRY

For Individual Years 1914-1924
Average Month in Each Year=100

Source: Bureau of Labor Statistics, State of Ohio



of the schedule used in collecting data since the year 1915"⁵ However, there are great variations in the number of reporting firms from year to year. The reports for a given year are collected at the close of that year and changes in the number of firms thus become apparent at intervals of one year. The law is obligatory on all employers, but the report forms are for the most part sent only to those known to employ normally five persons or more. Compliance is general, but it clearly is not complete and varies somewhat from year to year. However, the data are comparable for the months of a given year, since the report for that year is based on the returns from identical firms.⁶

For these reasons, it was not practicable to use the statistical methods generally employed for measuring seasonal variation. The method followed was, briefly, this: the data for the months of each year were expressed as percentages of the average month for the given year; the next step was to compute the arithmetic mean of the percentages for each of the twelve months, i. e., the mean of the January percentages, etc. In this manner, averages were secured for the 1914-1918 period, the 1919-1924 period, and the 1914-1924 period.

It should be pointed out that the percentages for each year are affected by the direction of construction activity during that year; i. e., if the direction is upward, the percentages will be abnormally high for the latter part of the year, and, conversely, abnormally low if the direction is downward. It will be recalled from Chart VIII in Chapter II that the trend in contracts awarded in Ohio since January, 1919, is only slightly upward. For this period the trend factor can be dismissed as having little bearing on the indices, computed as described above. Reference to Chart IV in Chapter II indicates a downward trend for the earlier part of the period, measured by building permits in seven Ohio cities. But it is apparent here that the trend was upward in two of the years, followed by a severe slump in 1917 and 1918. Building permit data are very untrustworthy and it is probable that the actual slump was not as great as pictured in Chart IV. Perhaps a better

⁵The Industrial Commission of Ohio, Bulletin Vol. IV, No. 2, (Columbus, 1924).

⁶This is true with one important qualification. The reports indicate the total number of wage earners on the payroll on the 15th of each month or nearest representative day. No provision is made for reporting the amount of time employed. Part time and full time workers are reported similarly as so many wage earners.

measure of the trend factor for this earlier period is afforded by the contracts awarded data for the Pittsburgh District, available for the entire period since 1914. This district includes Ohio, West Virginia, Kentucky and Western Pennsylvania. The Ohio Contracts normally constitute over half of the Pittsburgh District totals. Further, the changes in Ohio and the Pittsburgh District since 1919 are fairly closely correlated. Table XXII below shows the Contracts Awarded in the Pittsburgh District from 1914 to 1918.

TABLE XXII
CONTRACTS AWARDED IN THE PITTSBURGH DISTRICT
 1914-1918
 (In Millions)

Source: F. W. Dodge Corporation

Year	Actual Values	Deflating Index	Deflated Values
1914	\$141.75	100	\$141.75
1915	131.56	103	127.73
1916	196.52	121	162.41
1917	254.42	149	170.75
1918	389.11	176	221.09

It will be observed that these data differ significantly from the building permits data referred to above. Table XXII shows an increase for all years with the exception of 1915; the permits data show an increase in 1915 and phenomenal drops in 1917 and 1918. In view of the conflicting evidence it is not possible to know definitely the effect of the trend factor on the indices for this earlier period. However, in view of the changes in the direction of building from year to year during this period, the process of averaging the seasonal indices can be relied on to give an approximately accurate measure of the seasonal movement. The percentages for the individual years, Table XXI and Chart XXIV, show conclusively the regularity of the seasonal factor, differing only in small degree. Whether the year be one of depression or prosperity, the direction of the seasonal movement is apparent.

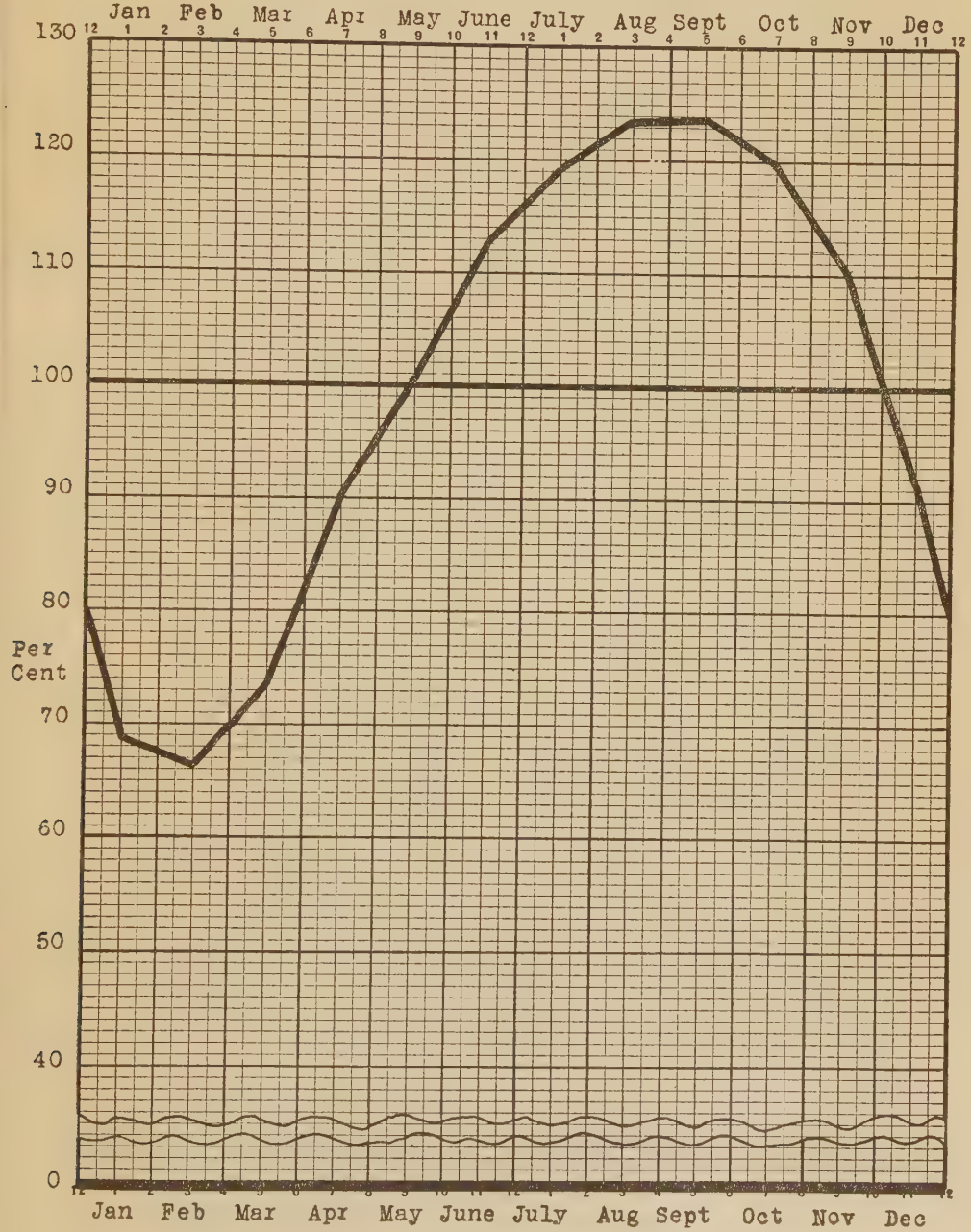
The average seasonal indices computed from the eleven year record are shown in Chart XXV. On this Chart the average month is the base or one hundred per cent. Table XXIII indicates the dispersion of the ratios for each month about their respective means

CHART XXV

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS ALL CONSTRUCTION, 1914-24

STATE OF OHIO

Average Month in Each Series Equals 100
Source: Division of Labor Statistics, State of Ohio



The relative smallness of these measures is further proof of the distinct seasonal movement. The seasonal indices are shown again in Chart XXVI, the base having been shifted from the average month to the month of greatest employment, as described in the section below. It is clear that the seasonal indices computed from this longer period, 1914-1924, are more reliable than those computed from the shorter periods.

TABLE XXIII
MEASURES OF DISPERSION
Reliability of the Indices of Seasonal Variation in Employment in the
Ohio Construction Industry Based on the Period 1914-1924

Month	Seasonal Indices	Standard Deviation	Probable Error
January	68.8	7.47	5.08
February	66.2	6.61	4.46
March	73.5	8.56	5.78
April	90.2	8.07	5.44
May	100.8	7.34	4.95
June	112.8	4.62	3.12
July	119.3	3.36	2.27
August	123.3	4.43	2.99
September	123.4	5.71	3.85
October	119.9	6.99	4.72
November	110.1	9.99	6.74
December	91.6	11.91	8.03

The average seasonal variation for the three periods (1914-1918, 1919-1924, and 1914-1924) is shown graphically in Chart XXVII. This chart justifies some comment. Reference has been made to the fact that it is generally believed that the seasonal construction curve has been smoothed out because of the greater prevalence of winter construction. As far as the State of Ohio is concerned, this chart presents a quantitative measure of the amount of smoothing accomplished. At first glance, the chart appears to refute the claim that any change has taken place. The curves for the earlier and the latter period cross and re-cross and appear to represent about the same fluctuations. Upon closer examination, one finds a measure of support for the smoothing

CHART XXVI

SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS ALL CONSTRUCTION STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

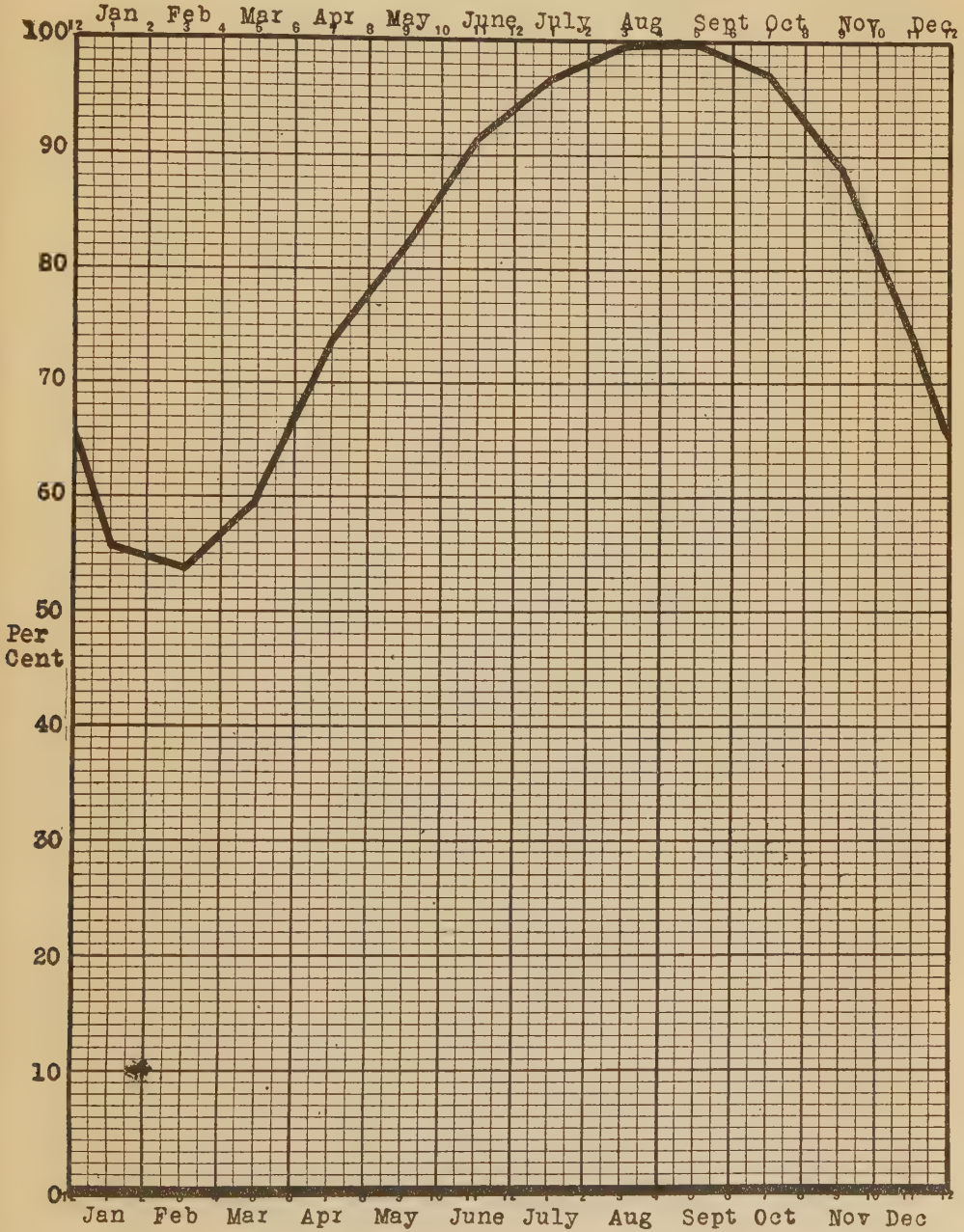
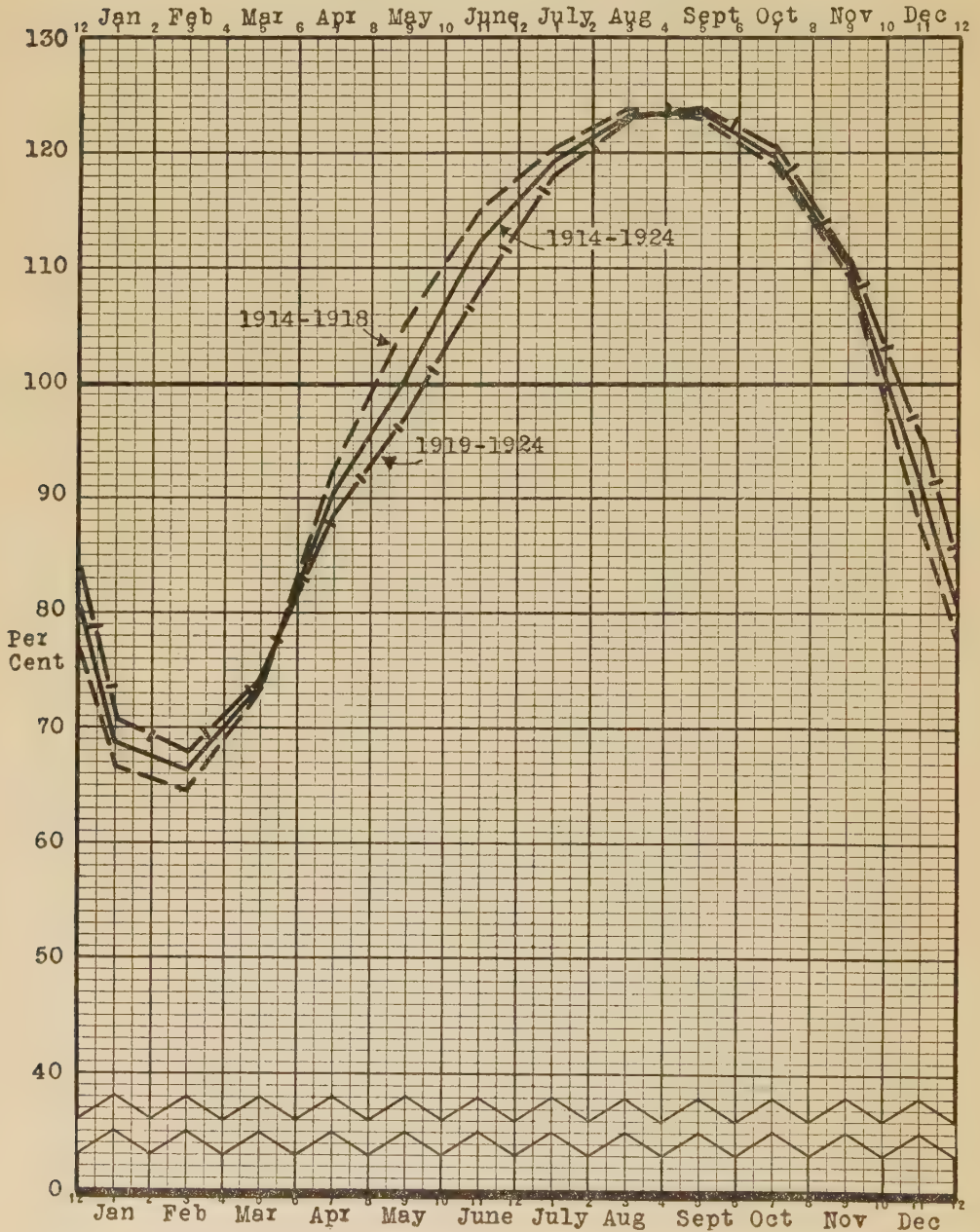


CHART XXVII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION **STATE OF OHIO**

Average Month in Each Series Equals 100
Source: Division of Labor Statistics, State of Ohio



claim. The curve for the 1919-1924 period is uniformly above the curve for 1914-1918 during the fall and winter months, and also for March. During the remainder of the spring months and during the summer months the 1914-1918 curve is above. This shows clearly that the tendency is to smooth out the seasonal curve by greater activity during the colder period of the year.

However, it is apparent that the improvement is decidedly minor. The greatest change has taken place in the indices for May and December; May of the earlier period is 105.4 per cent of the average month while May of the latter period is only 97.0 per cent of the average month; December of the earlier period is only 87.3 per cent of the average month while December of the latter period is 95.2 per cent of the average month. This reflects some improvement, but it can be seen readily that in the main essentials the curves are similar.

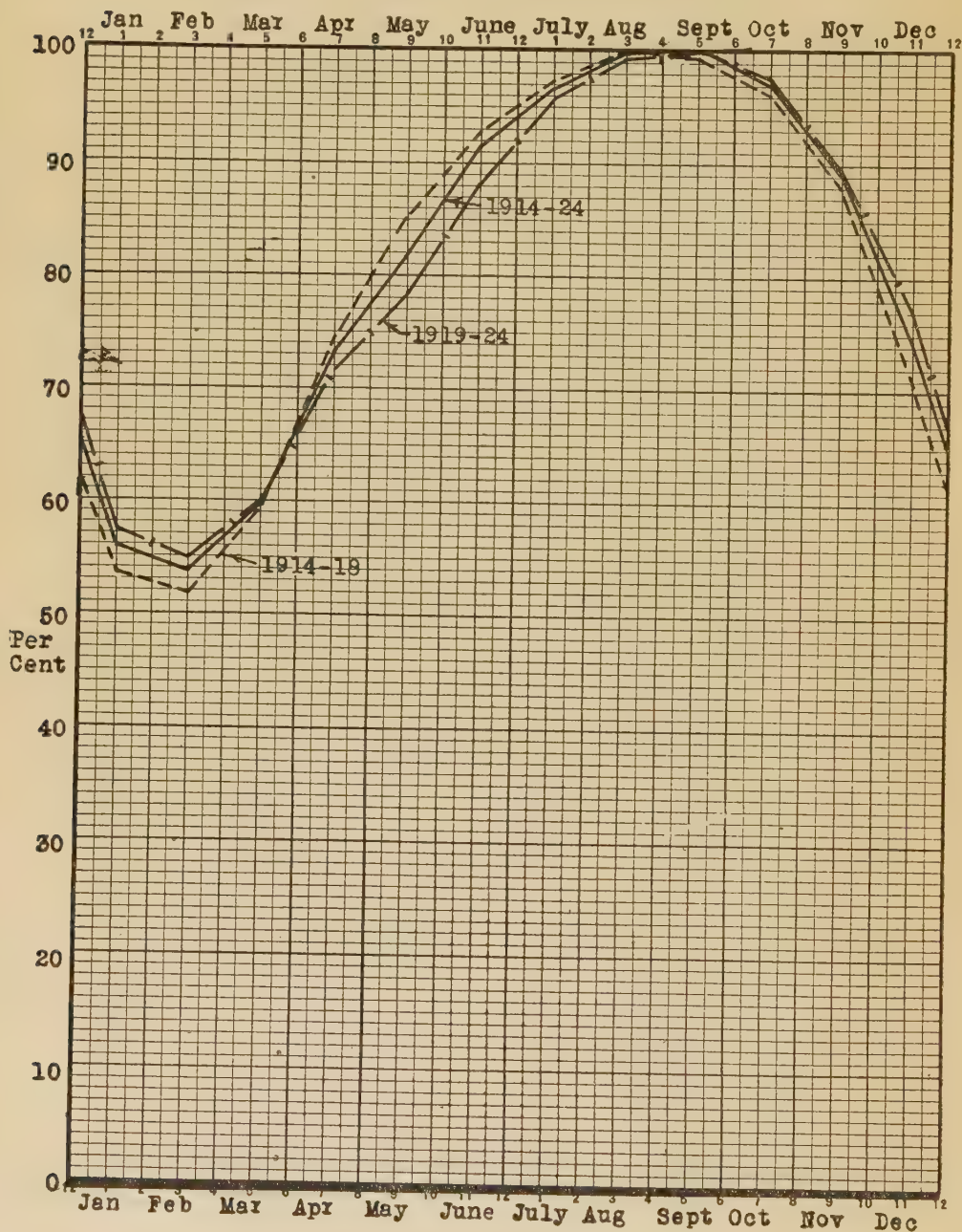
The same story is told in a somewhat different manner by Chart XXVIII. The method of computing these indices requires explanation. They are derived from the seasonal indices shown in Table XXI, the averages being plotted in Chart XXVII. For each period the highest seasonal index is taken as the base (100) for that period and the other percentages are expressed in terms of this new base. This is merely shifting the base from the average month to the month of greatest employment.

This is the most satisfactory method of securing indices of employment, considering the limitations of the data. The month of greatest employment is of more significance than the average month. In the use of indices of employment, one is interested in knowing what per cent of the total number of wage earners was employed on the average in a given month. The figure for the month of greatest employment is the only figure available showing the total supply of wage earners in the State or county. To ascribe a value of 100 per cent to this greatest value, of course, involves a certain fiction, since there is probably never 100 per cent employment of wage earners in any large industry. However, it is the only available quantitative measure of the total supply of wage earners in such a large industry. If only one-half of this largest number of wage earners is employed on the average for another month, then it is obvious that the percentage of employment for

CHART XXVIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION 1914-24 **STATE OF OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio



this month is 50 per cent. If a value of 90 per cent, for example, were ascribed to the month of greatest employment, the relation between that and the other months would not be altered.

Chart XXVIII also furnishes evidence of the extreme seasonal fluctuations in the construction industry. During January and February only slightly above one-half of the workers in the industry in Ohio are employed on the average. The record further shows for the eleven-year period that less than three-fourths of the workers are employed on the average during five months of the year, and only during four months of the year are practically all (more than 95 per cent) of the wage earners employed. The average employment for the year may be computed by averaging the twelve percentages for the eleven year period. This is found to be 81.0 per cent for the State. In other words, the amount of unemployment in the construction industry in Ohio is such that during an average year only four-fifths of all wage earners are employed.

This average percentage of employment would probably be reduced to not over 75 per cent if it were possible to secure a precise measurement. The average month of employment is given a value of 100, as already explained, and it is probable that this average month of greatest employment does not represent over 95 per cent of the workers available. This would reduce the annual average to approximately 75 per cent. In other words, it is probable that the average worker in the construction industry is employed only about nine months of a normal year.⁷

This suggests that if the normal seasonal peaks and troughs could be smoothed out, there would be an oversupply of wage earners. It has been suggested in some quarters that the present restrictive immigration law is resulting in a severe shortage of laborers for the construction industry. In view of the highly seasonal fluctuations of employment in the industry in Ohio, as above

⁷There is one other significant reason for believing that the average percentage of employment is actually overstated by the data, both for the year and for the winter months. As pointed out earlier in this chapter, the reports do not differentiate between part-time and full-time workers. If the amount of part-time work varied in proportion to total employment, then this qualification would have little bearing. It is more likely to be true, however, that the amount of part-time work is greatest in the dull or winter season. On this basis, it is probable that the percentages of employment for the winter months are actually less than those indicated by the charts.

outlined, and in further consideration of the fact that experience shows conclusively that winter construction is practical (which subject will be treated in a later section of this report), the evidence points rather to an over-manned industry than to a shortage of wage earners.

Brick, Stone and Cement Work

The seasonal fluctuations of employment in this group correspond fairly closely with those for "All Construction." This can be seen readily by comparing the accompanying Chart XXIX with Chart XXVIII. The greatest difference is shown in the first half of the year, the curves for the Brick, Stone and Cement group being consistently lower. This is most apparent in January, February, and March, and is also noticeable in December. The average percentage of employment is below 50 for January and February for all three periods, with the exception of the 1919-1924 curve for January which is 50.2 per cent. In other words, the suspension work during the cold months is more general in this group than in "All Construction."

The average percentage of employment for the year is 77.7.

Electrical Contracting

This relatively small group is characterized by fairly regular employment. The average percentage of employment, as shown by Chart XXX, has never been below 80; for the 1919-1924 period, the average percentage of employment is above 90 for eight months and only slightly below 90 for the remaining four months. Nevertheless, the period 1919-1924 shows improvement, i. e., a tendency for even more regular employment.

The average percentage of employment for the year is 93.0.

General Contracting

The General Contracting group is the most important of the construction industry in Ohio from the standpoint of the number of wage earners employed, accounting for over 40 per cent of the total number of wage earners reported in 1924. For this reason, one would expect the seasonal employment curve to be a close counterpart of that of "All Construction." This is what the record discloses. The two curves are plotted in Chart XXXI and it can be seen that they are practically identical.

The seasonal movement in the General Contracting group for

CHART XXIX

SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS BRICK, STONE, AND CEMENT WORK STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

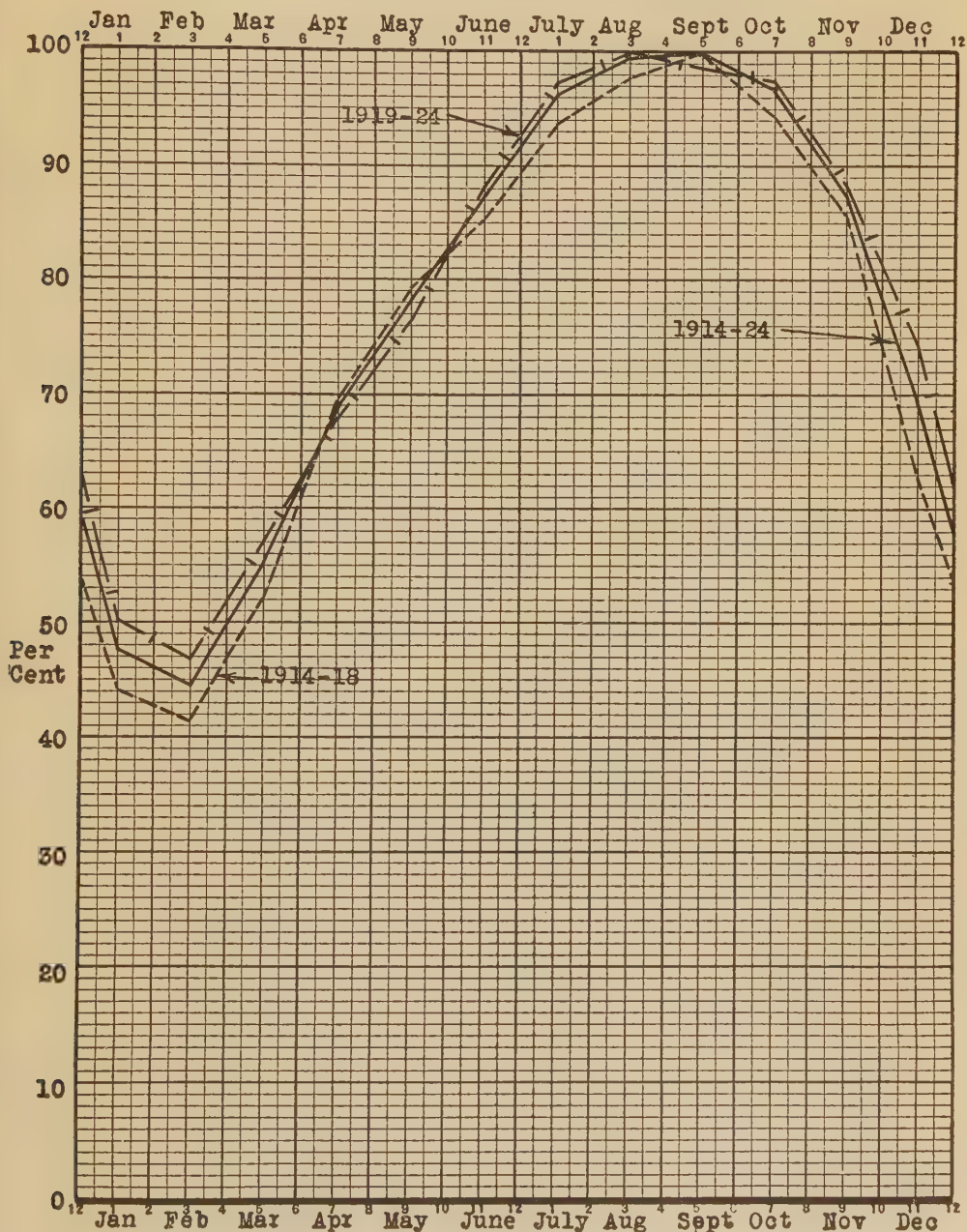


CHART XXX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ELECTRICAL CONTRACTING **STATE OF OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

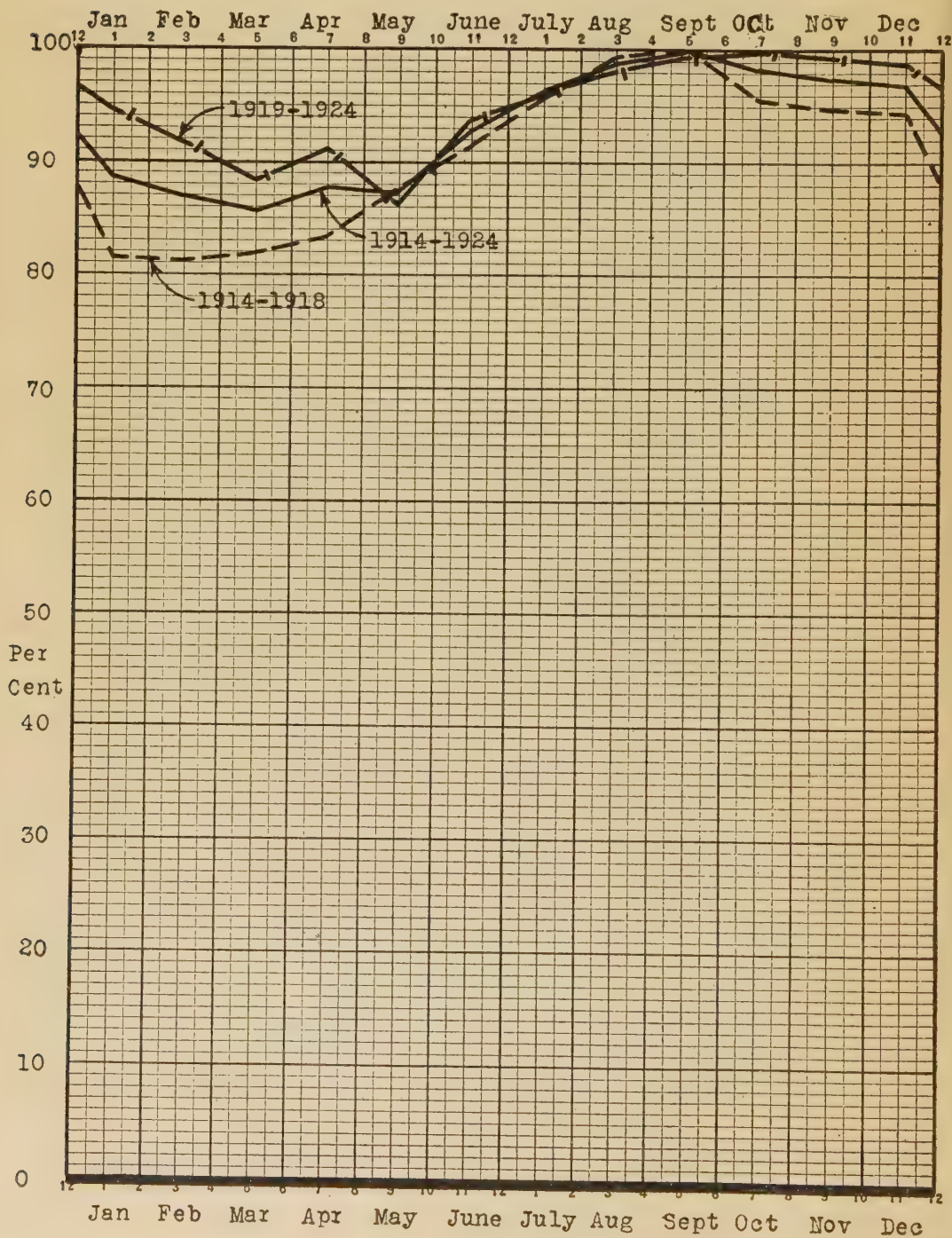
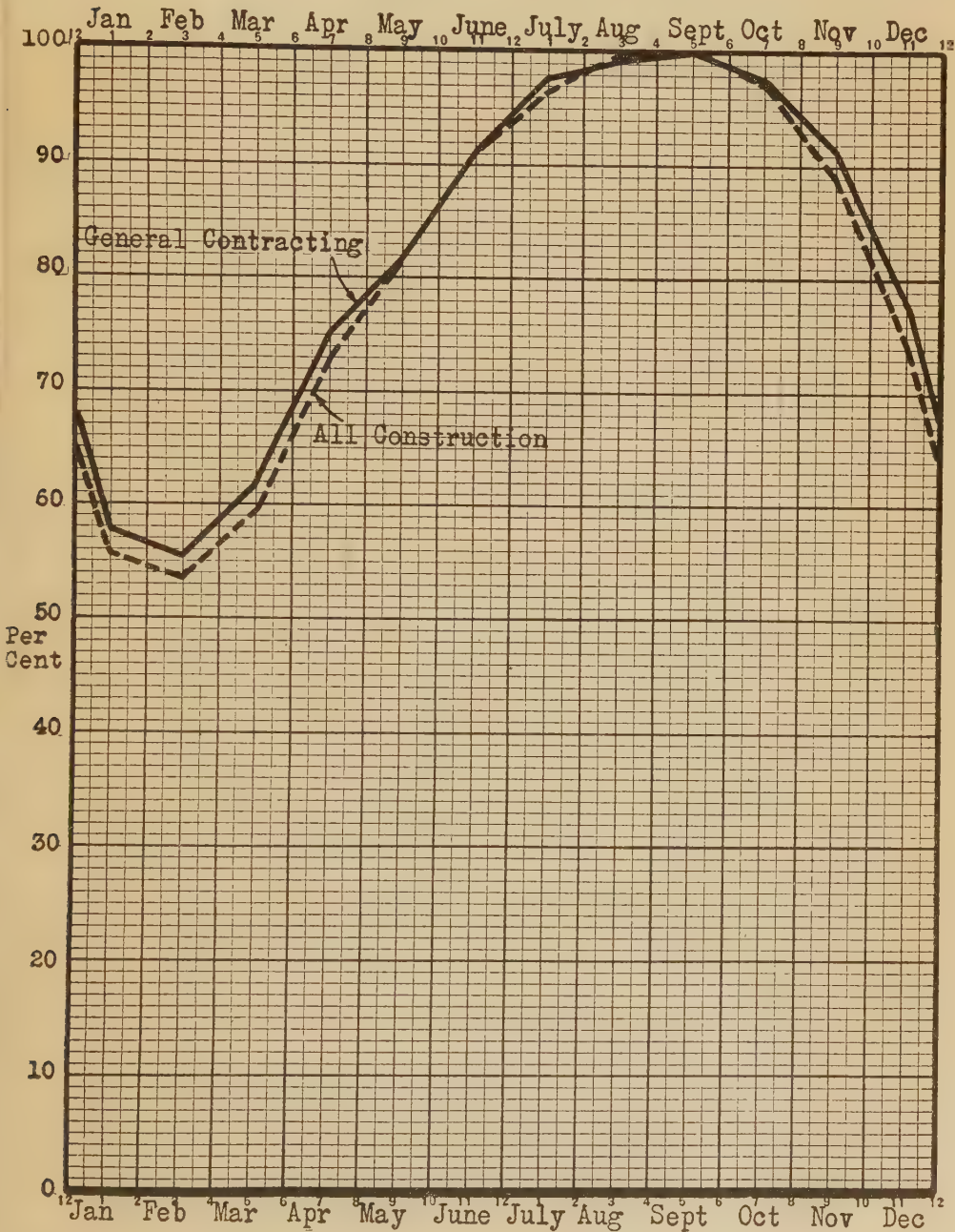


CHART XXXI

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS GENERAL CONTRACTING AND ALL CONSTRUCTION STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio



the three periods is shown in Chart XXXII. The same minor improvement is noted in the 1919-1924 period; this curve is slightly above the curve for the earlier period in December, January, February and March. But it should be emphasized that the change is very slight. The curves for the same two periods are substantially the same.

The average percentage of employment for the year is 82.3.

Painting and Decorating

The seasonal curves in Chart XXXIII for this group show extreme fluctuations but the fluctuations are peculiar to this group in one important respect. This is in the seasonal peak, which comes in May or June rather than in August or September, as in the case of "All Construction." This is, of course, accounted for by the prevalent practice of redecorating during the spring months. Following this spring peak, there is another period of fairly high and sustained activity lasting through October. This represents, doubtless, the peak period in painting and decorating new buildings.

The average percentage of employment for the year is 77.7.

Plastering, Including Lathing

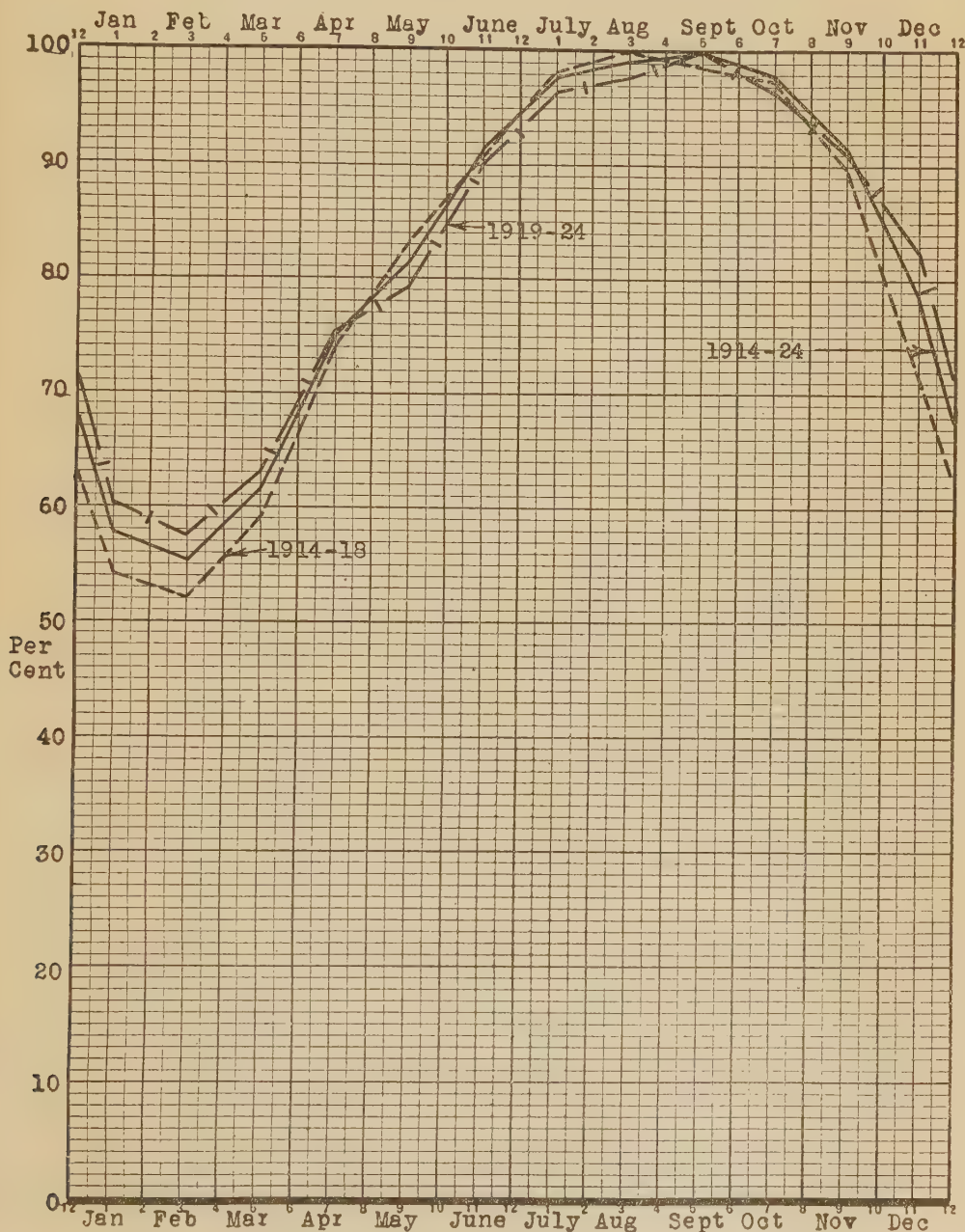
This group presents rather peculiar differences in the curves for the earlier and latter periods, as is readily seen from Chart XXXIV. It is also evident that this group shows a remarkable degree of smoothing out of the seasonal curve. The curve for the earlier period indicates extremely low levels of activity for the six months from October through March. During five of these six months, the percentage of employment is below 80, and for the sixth month the figure is only 83.9 per cent. The curve for the 1919-1924 period is, on the other hand, never below the 68 per cent line. The change is remarkably great in the last three months of the year, as will be seen from the chart. This shows rather conclusively that the plastering group has become converted to the idea of continuous work during the cold months. The transition is, of course, relatively simple in the case of this group, most of its work being indoors.

The average percentage of employment for the year is 85.0.

Plumbing and Steam Fitting

One would naturally expect to find less extreme seasonal fluctuations in employment in this group, since the industry is relatively less dependent on new building for employment and also

CHART XXXII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
GENERAL CONTRACTING
STATE OF OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio



PAINTING AND DECORATING

STATE OF OHIO

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

CHART XXXIII

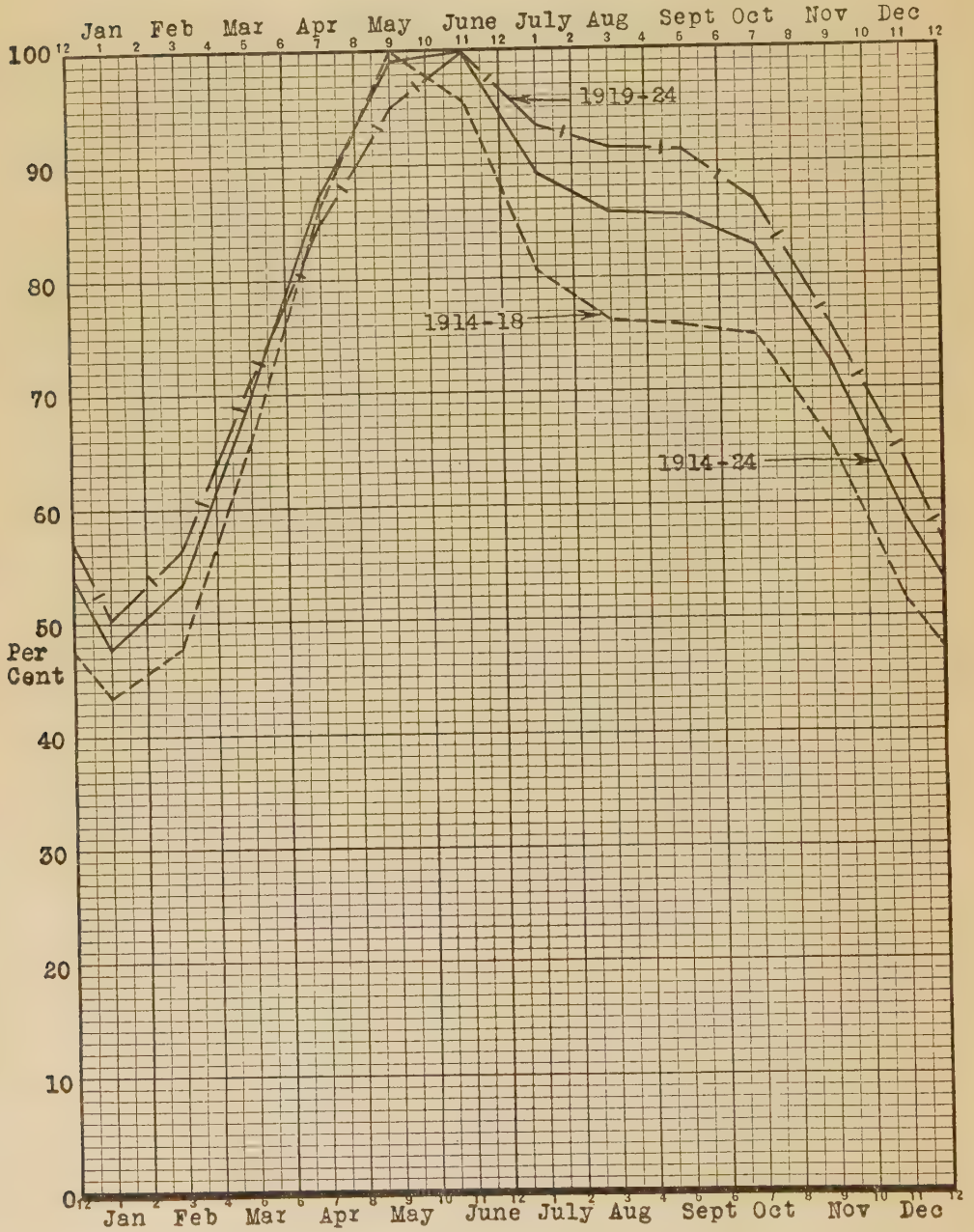


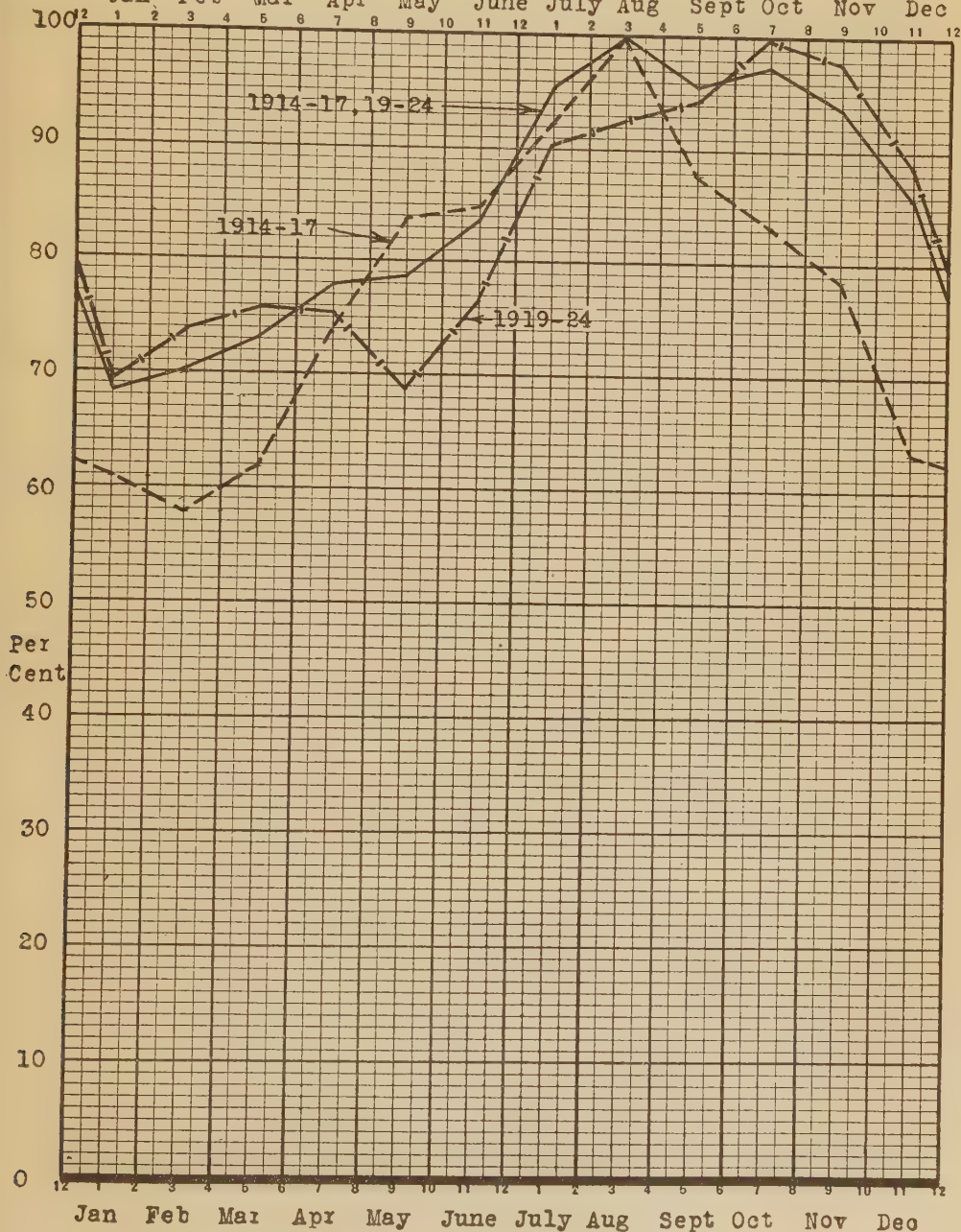
CHART XXXIV

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS PLASTERING AND LATHING STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec



because the work is done indoors. The chart (No. XXXV), discloses fairly regular employment, the months of greatest activity being September, October, November and December, the peak month being October. The chart reflects slightly greater activity in November and December in the 1919-1924 period compared with the earlier period (in January and February, there is almost imperceptible improvement). On the other hand, the chart shows decidedly less activity from March through September in the 1919-1924 period.

This group apparently has actually suffered from the tendency to prolong the building season through the fall and early winter. This may be seen by comparing the average annual percentages of employment for the 1914-1918 and 1919-1924 periods. The figure is 91.7 for the earlier period and 88.6 for the 1919-1924 period. The reason for this is clear. The peak season has always been the fall and early winter. Prolonging the building season has so far only resulted in accentuating the peak in the Plumbing and Steam Fitting group. However, it should be observed that if the building season were further prolonged, the effect would doubtless be to give greater employment to this group in the late winter and early spring months, which are the slack seasons shown on the chart.

For the entire period the average percentage of employment for the year is 90.0.

Sand and Gravel Excavating

In this group, activity is sustained at a fairly high level, as shown by Chart XXXVI, from May through November, while in December, January, February, and March there is a severe slump in employment. The distinctive feature about the curves for this group is the seasonal "hump" rather than a seasonal "peak" in employment in the warm period. Only slight changes have taken place in the seasonal curves over the two periods, the 1919-1924 curve showing larger percentages of employment in January and February. The group is a small one, numbering only 1,327 wage earners in the month of greatest employment in 1924.

The average percentage of employment for the year is 82.8.

Sheet Metal Work and Roofing

This group is characterized by fairly regular employment and a late seasonal peak (Chart XXXVII). The peak month is Novem-

CHART XXXV

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS PLUMBING AND STEAM FITTING STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

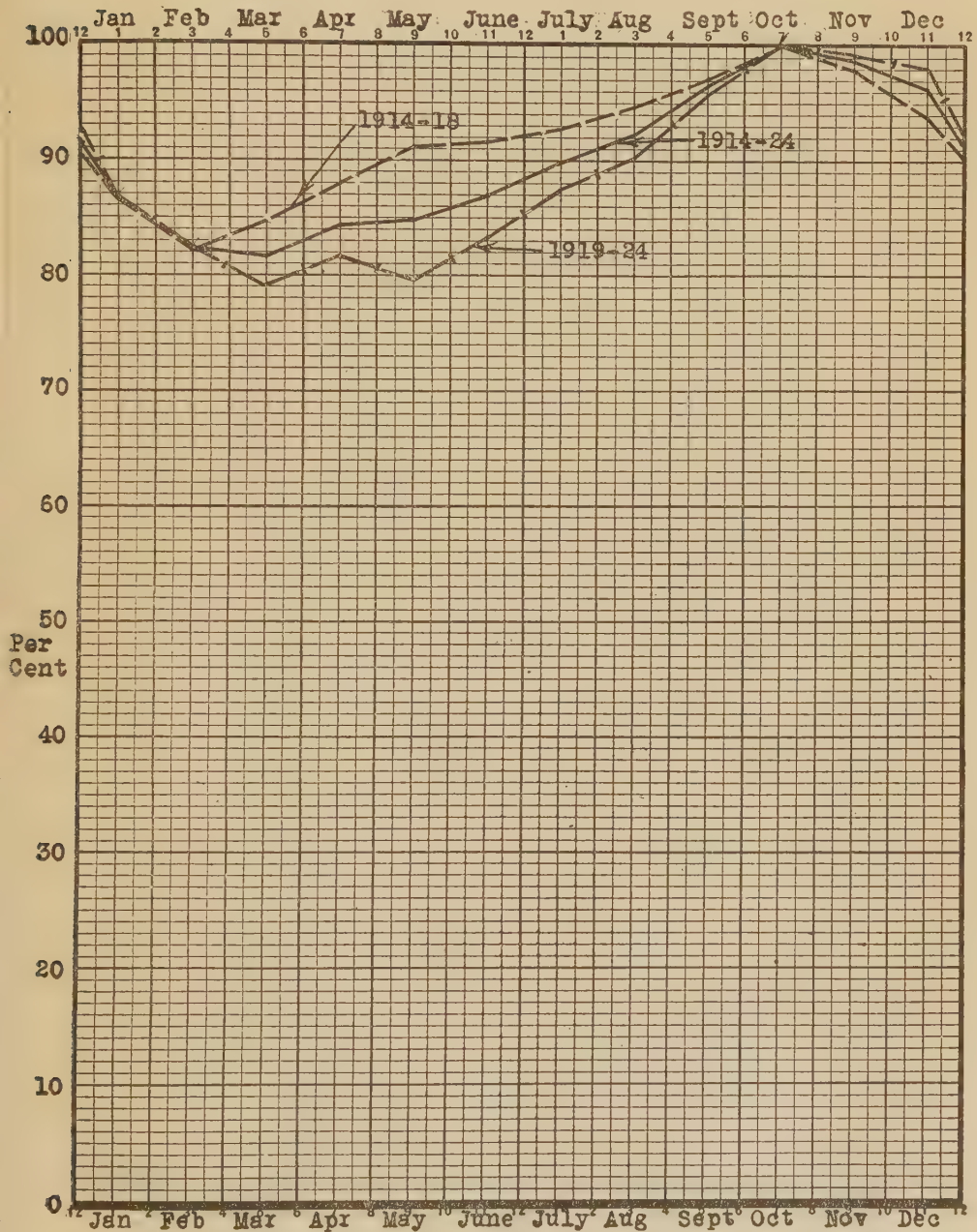


CHART XXXVI
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 SAND AND GRAVEL EXCAVATING
 STATE OF OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

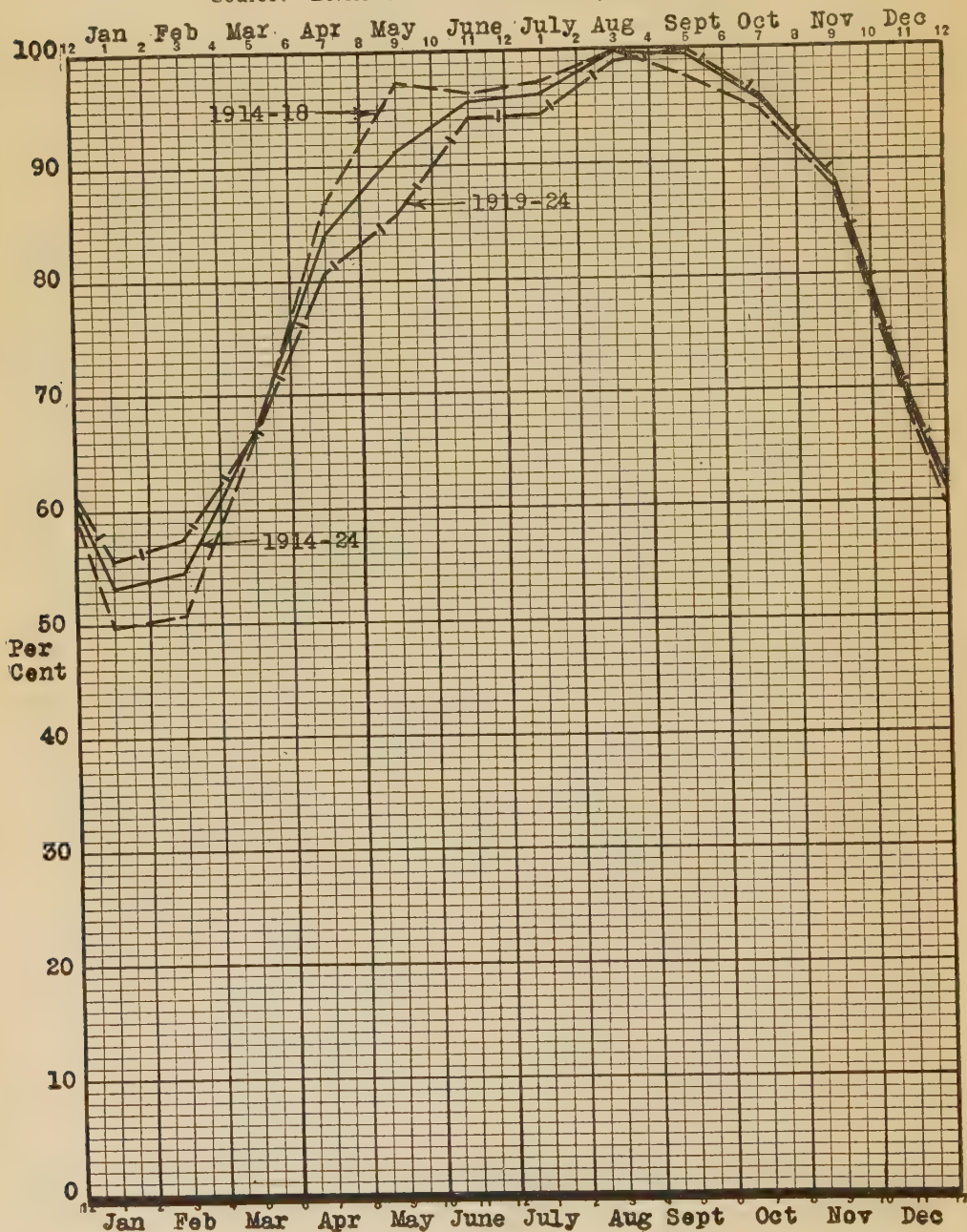
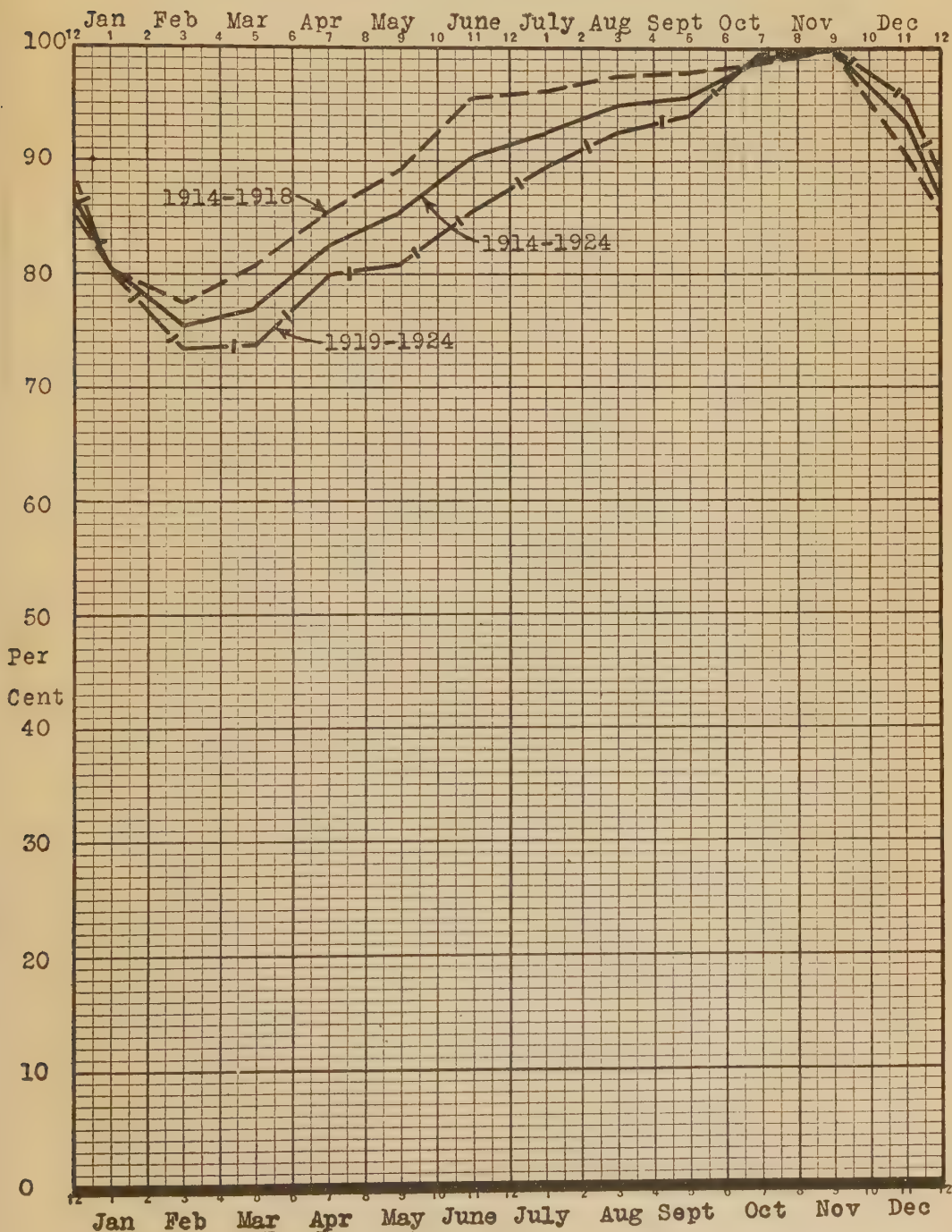


CHART XXXVII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS SHEET METAL WORK AND ROOFING STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio



ber in all three periods, with October showing only very slightly less employment. The work performed by this group comes well toward the close of a given project; hence the peak season (October and November) comes just after the peak season in "All Construction" (August and September).

It is interesting to note that the curve for the 1919-1924 period is above that for the earlier period in October and December only; for the remainder of the year (except November, the peak month for both periods), the earlier curve is above the 1919-1924 curve. It thus appears that this group is another which has suffered from the tendency to prolong the building season into the fall and early winter months.

The average percentage of employment is 88.8.

Street, Road, and Sewer Contracting

The work of this group is performed entirely outdoors and is highly dependent on favorable weather conditions. The extreme seasonal fluctuations shown in Chart XXXVIII are, therefore, not at all surprising. It is, however, very surprising to find that the 1919-1924 curve shows lower percentages of employment for every month except for the months of October through January when the curves are practically the same (August is an exception, being the peak month for the 1919-1924 curve). The explanation of this situation is probably to be found in the trend toward hard surfaced roads which require warm weather for their construction.

The average percentage of employment for the year is 66.1.

Ventilating and Heating

Seasonal employment in this group, as indicated by Chart XXXIX, varies greatly from the other groups in the construction industry. The seasons of greatest employment are the fall and the first two winter months, as naturally would be expected, considering the nature of the work performed by this group. The spring months constitute the dullest season and the summer months are not much better.

The Ventilating and Heating firms have not benefited greatly by the partial prolonging of the construction season into the fall and early winter months. The result so far has merely been to accentuate the peak season. The curve for 1919-1924 shows greater percentages of employment for September and October than for the earlier period but smaller percentages in December and from

CHART XXXVIII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS STREET, ROAD, AND SEWER CONTRACTING STATE OF OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

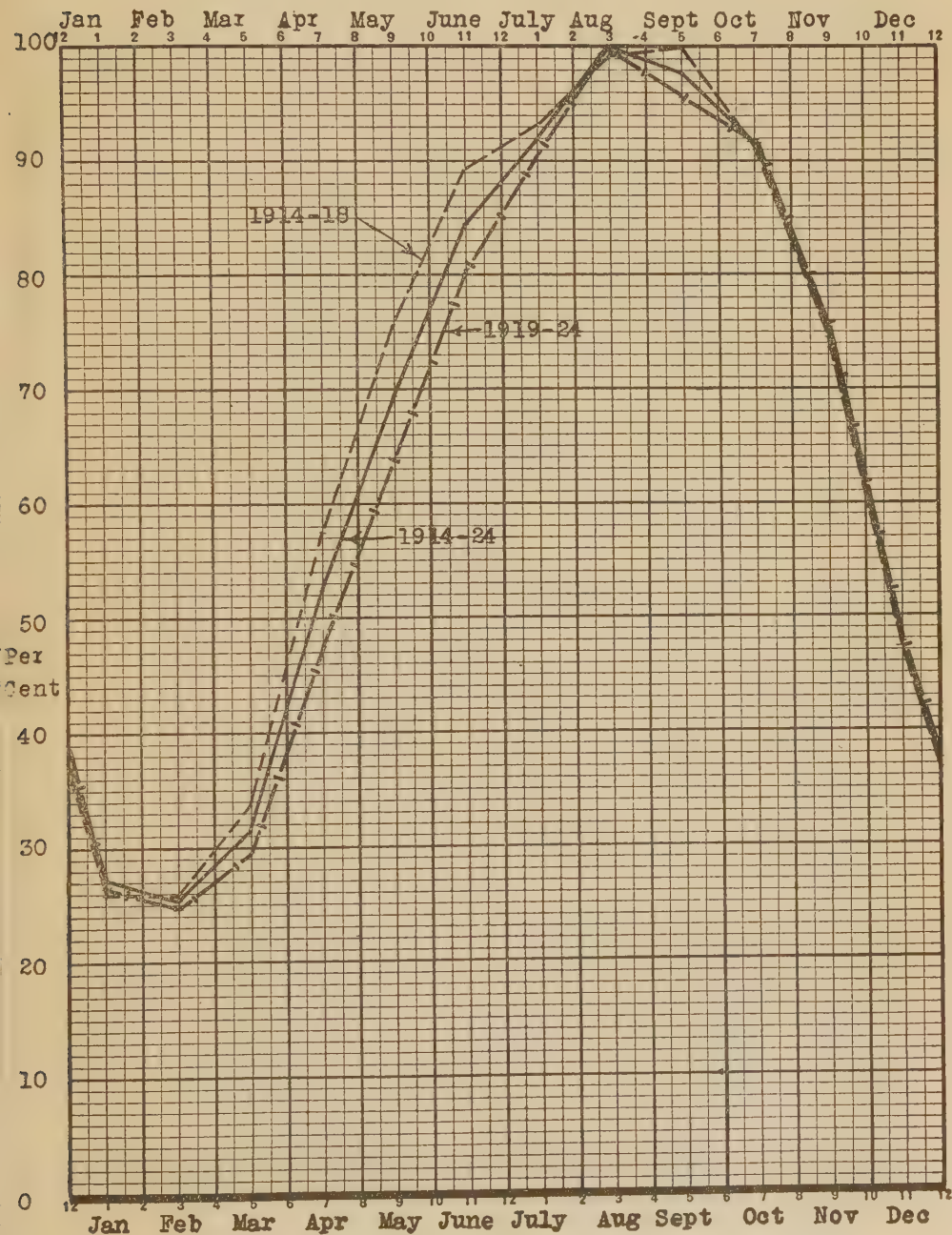
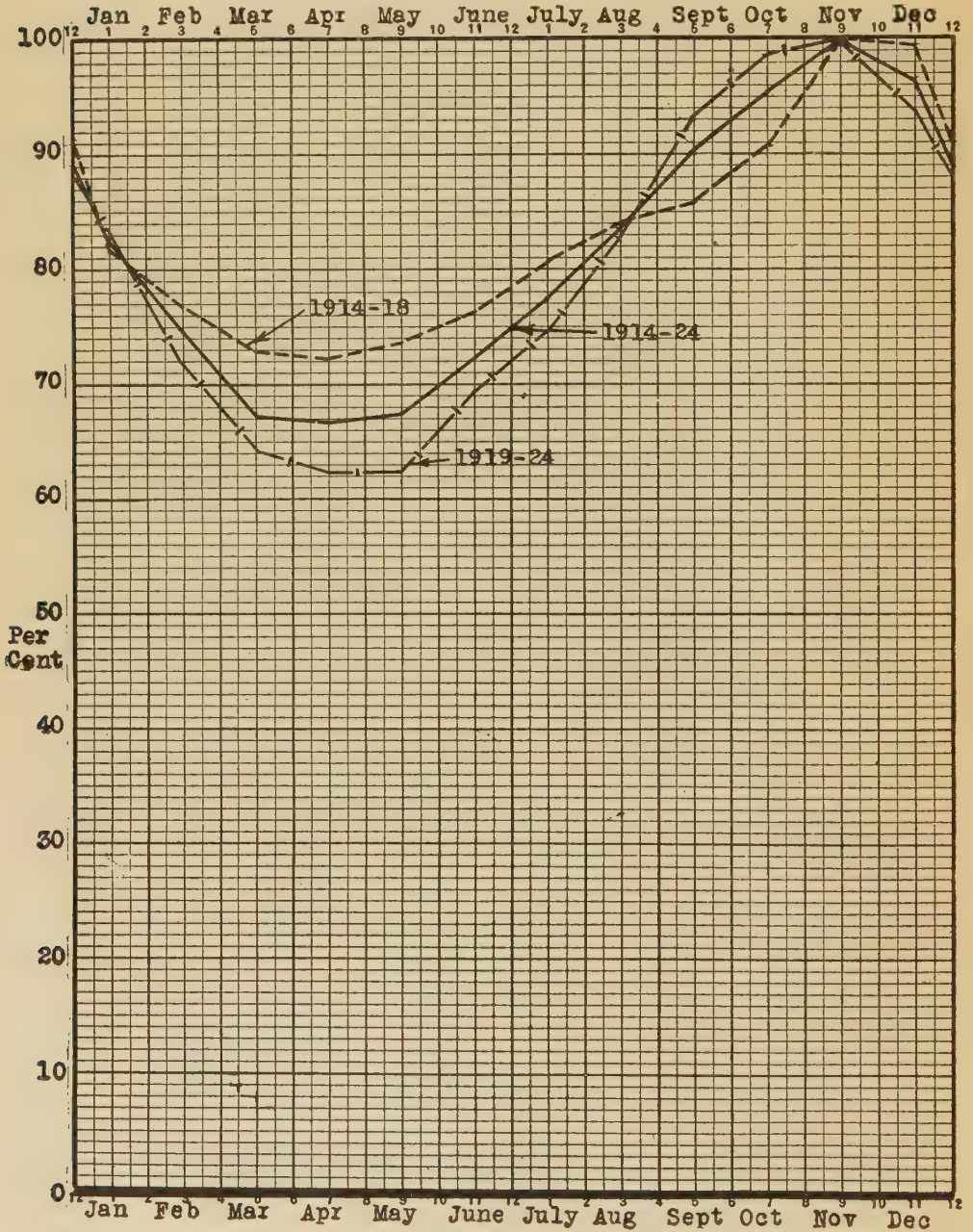


CHART XXXIX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
HEATING AND VENTILATING **STATE OF OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio



February through August. This group, however, is a very small one, numbering only 672 wage earners in the month of greatest employment in 1924.

The average percentage of employment for the year is 81.0.

The Seven Leading Counties

The Charts at the close of this Chapter (Nos. XL to CI) show the seasonal fluctuations in employment in the various groups of the construction industry for the seven leading counties. Further comment is unnecessary since the technique involved is the same as that which has already been described in the case of the same groups for the entire State.

The Economic Loss Involved in Seasonality of Employment

It is impossible to state in quantitative terms the exact economic loss which this extreme seasonality in building involves. It is certainly a great loss and constitutes a major social problem. It is of vital concern to the average workman in the construction industry when he can count on employment only during three-fourths of the year in his trade. This is the case in the Ohio construction industry, as has already been pointed out. The records used in this study do not indicate whether this average wage earner in the construction industry secures other employment during his compulsory period of idleness in his building trade. If we assume that these building trades workers do not secure other employment, it is possible to determine quantitatively the average amount or extent of unemployment in Ohio occasioned by seasonally fluctuating activity in the Ohio construction industry.

It will be recalled that average indices of seasonal variation have been computed for "All Construction" in Ohio, the month of average greatest employment being the base. We assume that all wage earners in the industry are employed during this peak month. If we give this peak month a value in terms of the total number of wage earners in the industry, the average unemployment may be computed readily. Using the reports for the latest year available (1924), we find that there were 85,301 wage earners employed in the peak month. The accompanying table (No. XXIV) shows the results from this method.

It is not possible to say whether the figures in the above table overstate or understate the average unemployment in the building

TABLE XXIV
ESTIMATED AVERAGE UNEMPLOYMENT IN THE CONSTRUCTION
INDUSTRY IN OHIO

Based on Seasonal Indices for 1914-1924 and Number of
Wage Earners Reported in 1924
Greatest Number of Wage Earners Reported in 1924 (85,301)=100

Month	Average Per Cent Employment 1914-1924	Average Per Cent Unemployment 1914-1924	Average Number of Wage Earners Unemployed
January	55.7	44.3	37,788
February	53.6	46.4	39,580
March	59.6	40.4	34,462
April	73.1	26.9	22,946
May	81.7	18.3	15,610
June	91.4	8.6	7,336
July	96.6	3.4	2,900
August	99.9	0.1	85
September	100.0	0.0	0
October	97.2	2.8	2,388
November	89.2	10.8	9,213
December	74.2	25.8	22,008
Year Average	81.0	19.0	16,207

trades in Ohio. It is probable, however, that the figures actually understate the average unemployment, since it is entirely unlikely that all the workers in a large industry covering an area the size of Ohio are ever fully employed.

The economic loss to the employers and to the public is of a sort which defies measurement. Nevertheless, it is generally recognized as a severe loss. It can be pointed out, of course, that the seasonal percentages of employment of wage earners can be applied to building employers also. When so applied it can be said that these figures indicate percentages of activity of the average construction employer. Not only is the employer subjected to a loss of business in the dull months, but his whole organization suffers because of his inability to keep this organization intact. The result is that he must build up a new organization each spring. The chaotic conditions in the building industry are notorious and this

factor of seasonality in activity is probably the greatest contributing cause. There is a further loss in that much work must be crowded into the busy season, resulting in feverish activity and the frequent use of unskilled or semi-skilled workmen for tasks which demand skilled craftsmen for proper performance. The losses occasioned by crowding all building activity into the warm season are, in the last analysis, borne by the public.

CHART XL
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

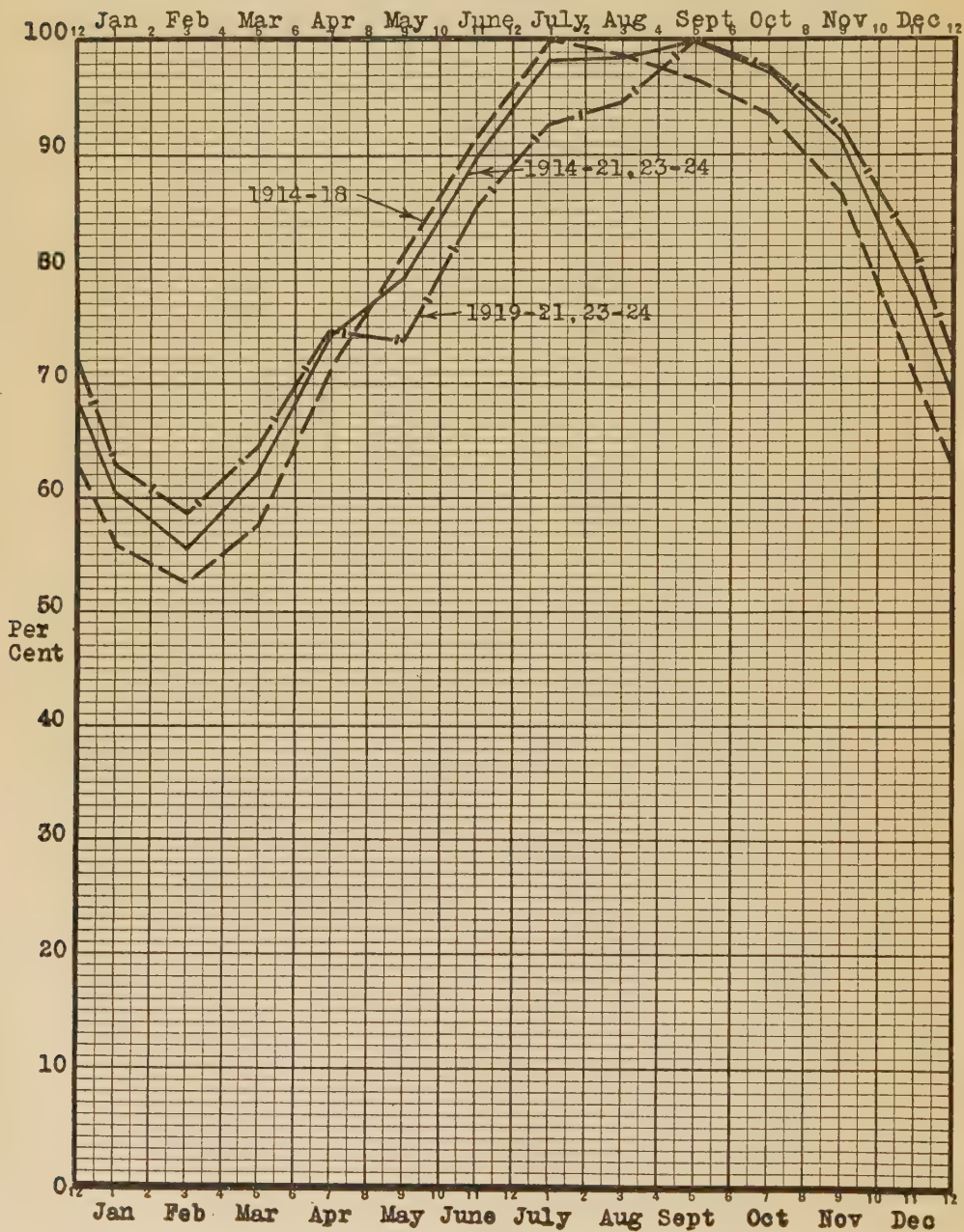


CHART XLI

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS BRICK, STONE AND CEMENT WORK CUYAHOGA COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

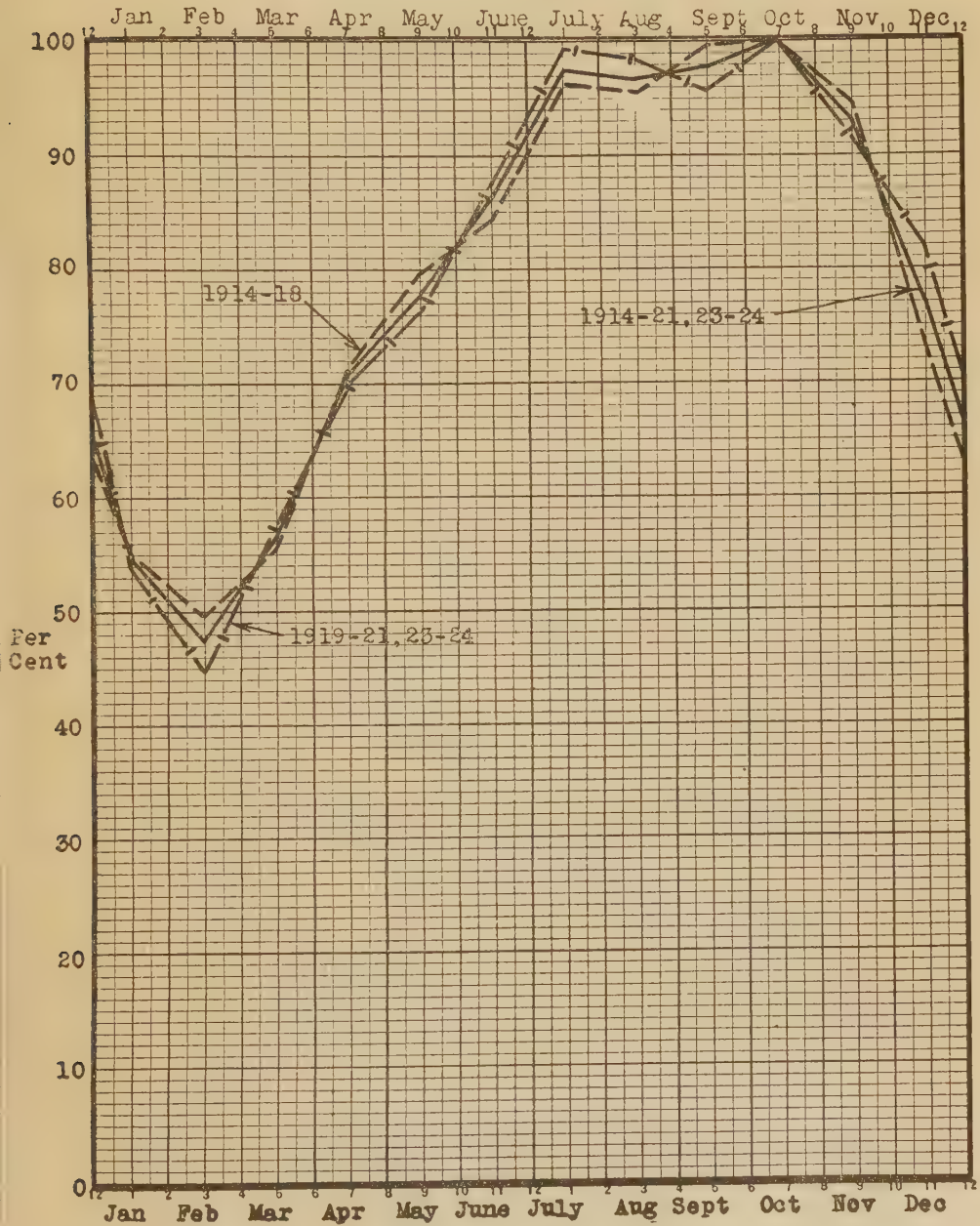


CHART XLII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ELECTRICAL CONTRACTING **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

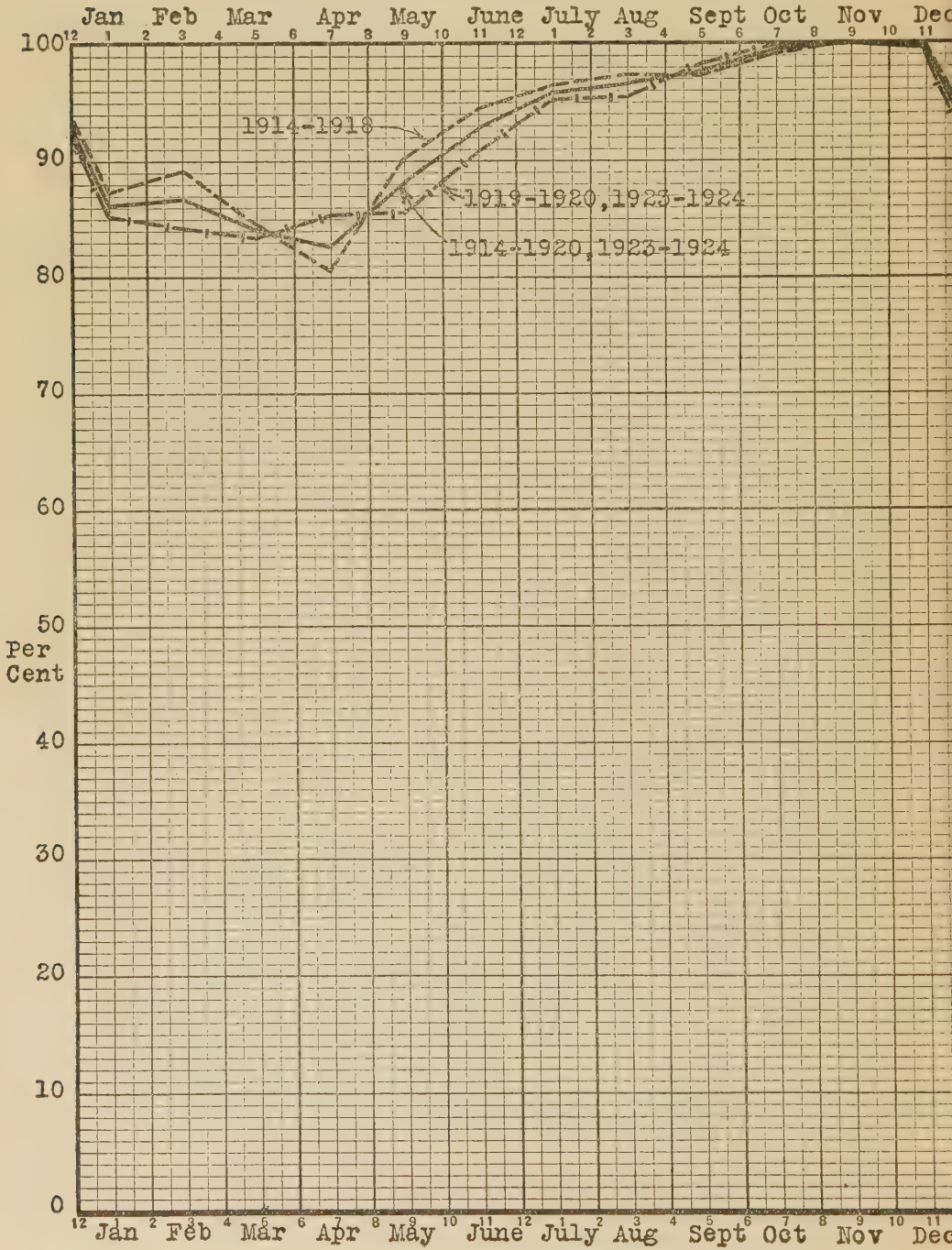


CHART XLIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
GENERAL CONTRACTING **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

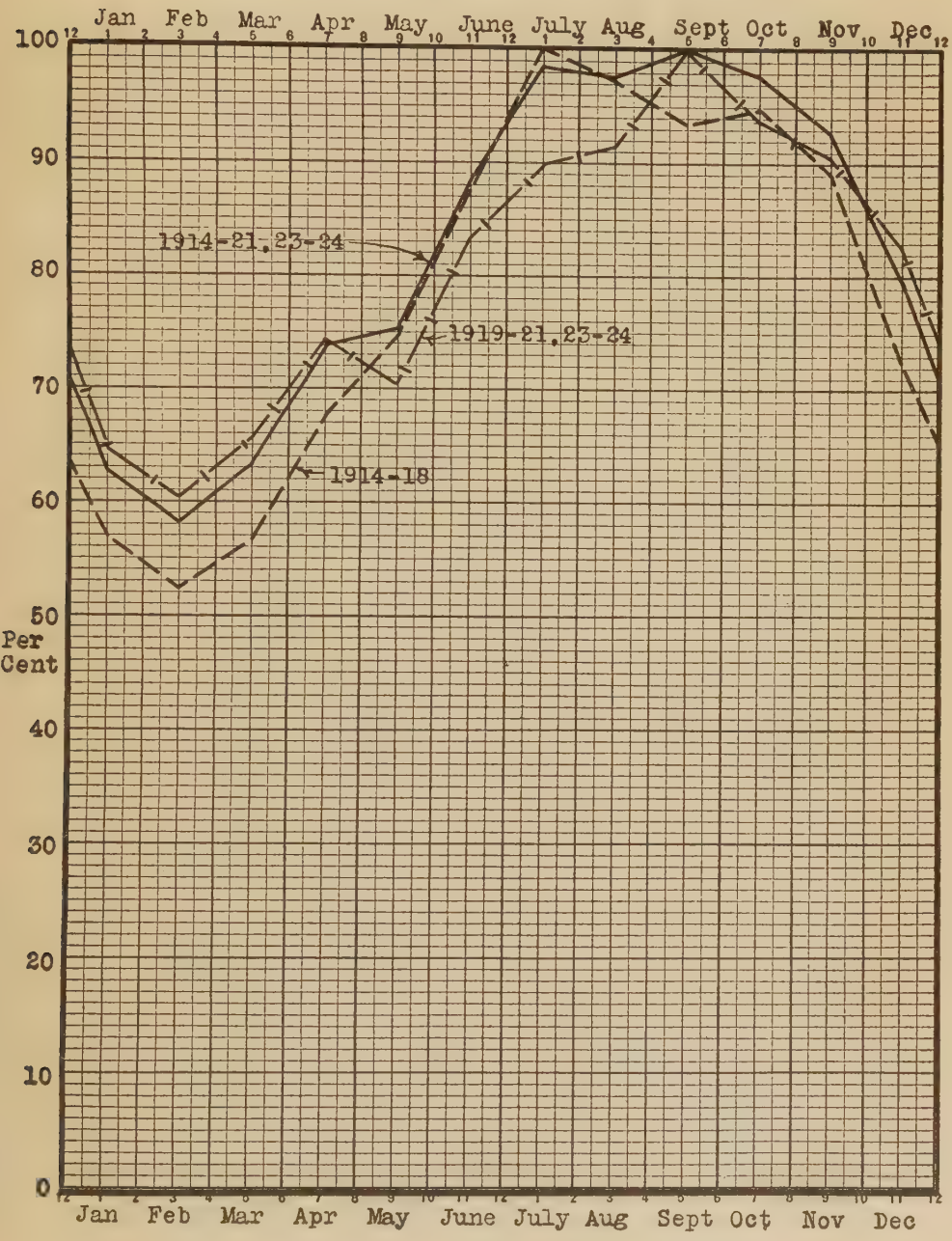


CHART XLIV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PAINTING AND DECORATING **CUYAHOGA COUNTY, OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

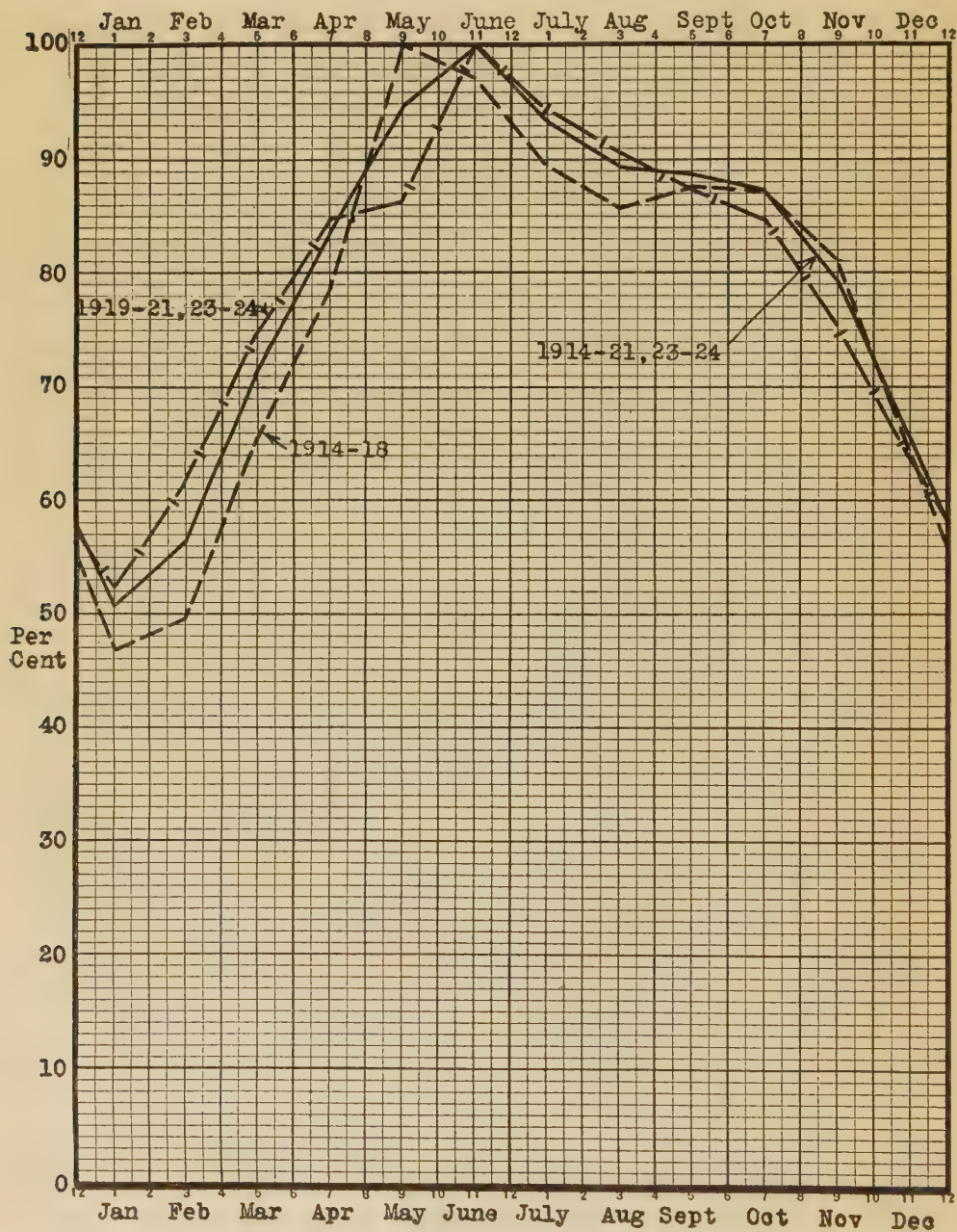


CHART XLV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PLASTERING AND LATHING **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

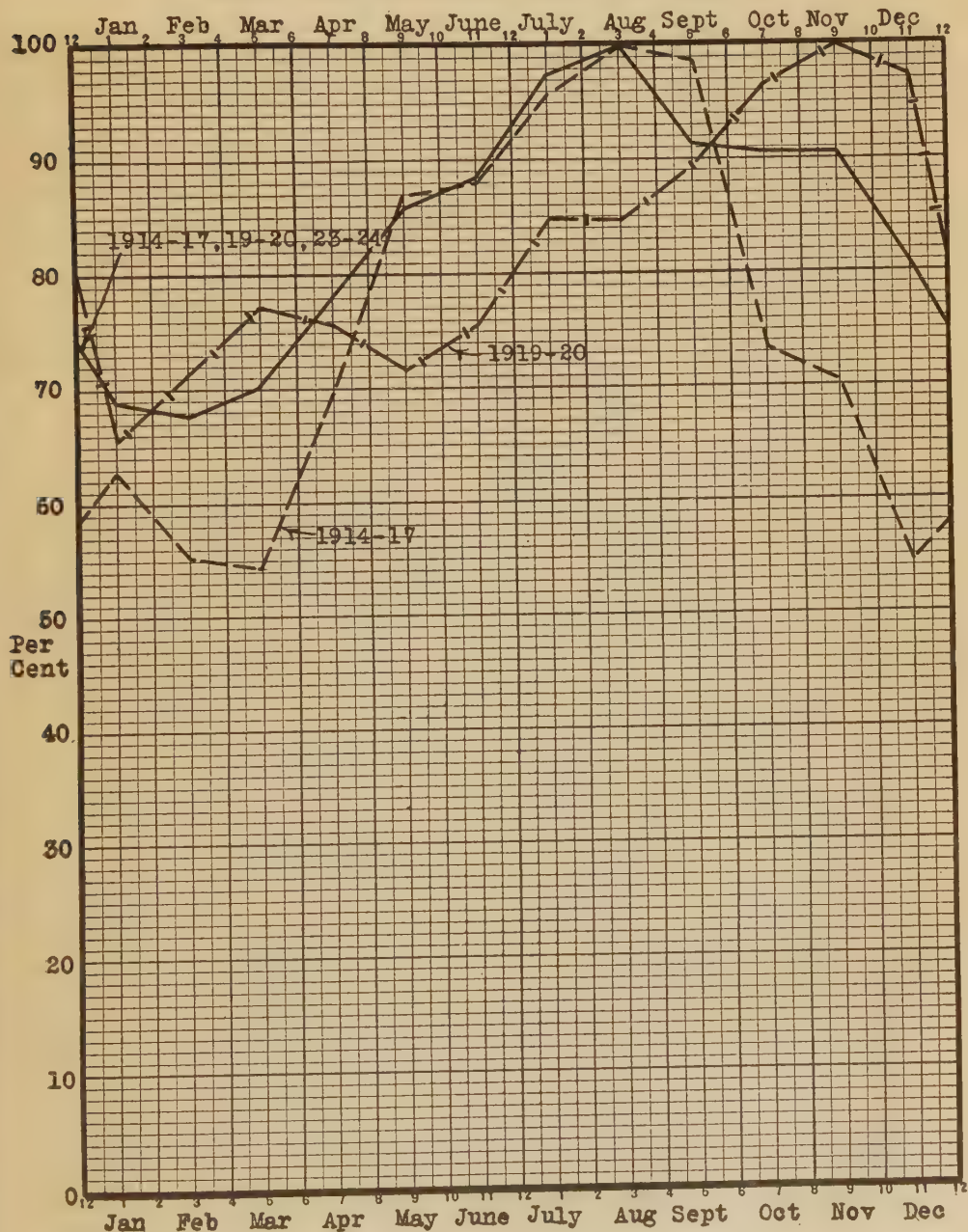


CHART XLVI
SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS
PLUMBING AND STEAM FITTING **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

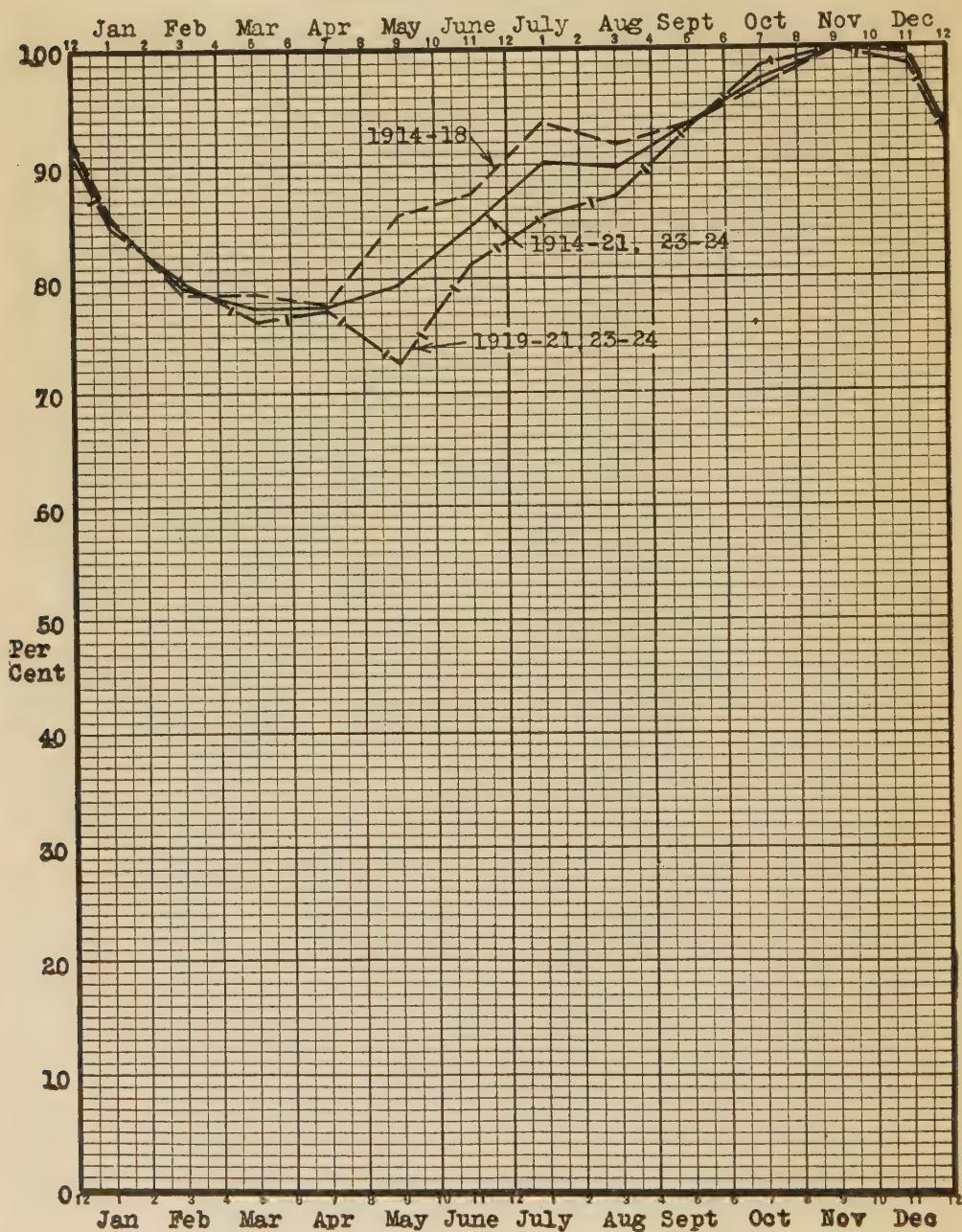


CHART XLVII
SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS
SHEET METAL WORK AND ROOFING **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

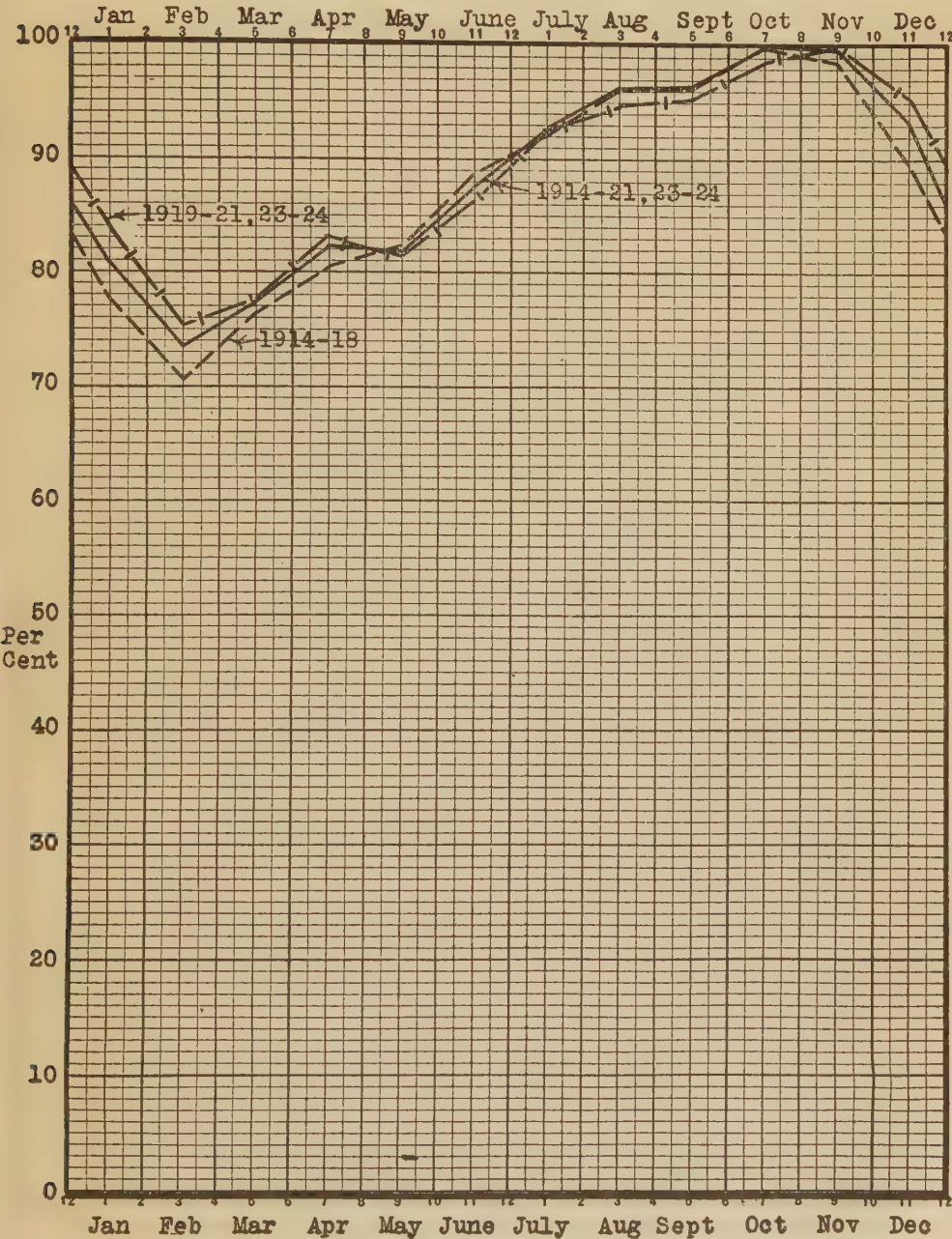


CHART XLVIII
SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS
STREET, ROAD, AND SEWER CONTRACTING CUYAHOGA COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

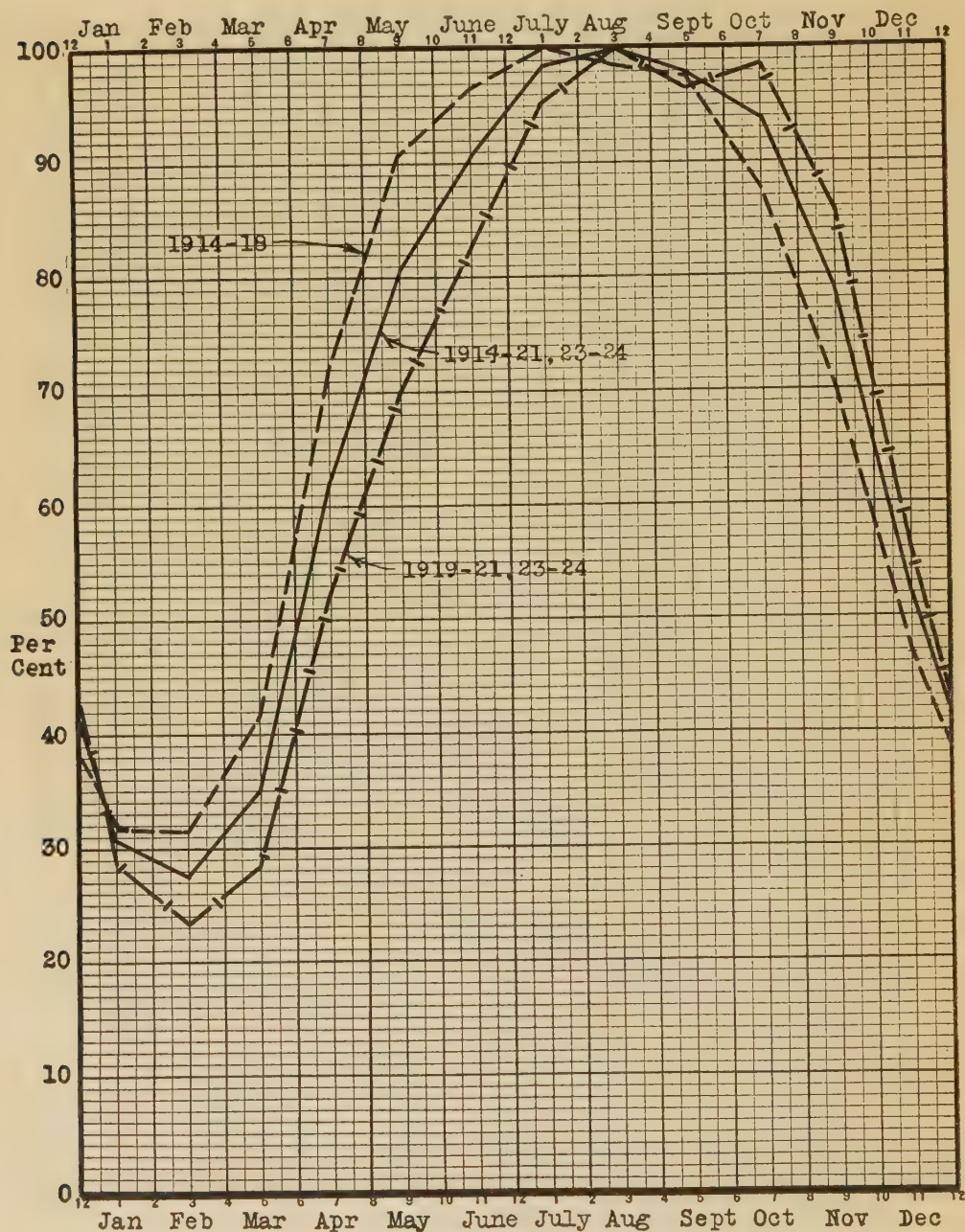


CHART XLIX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
VENTILATING AND HEATING **CUYAHOGA COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

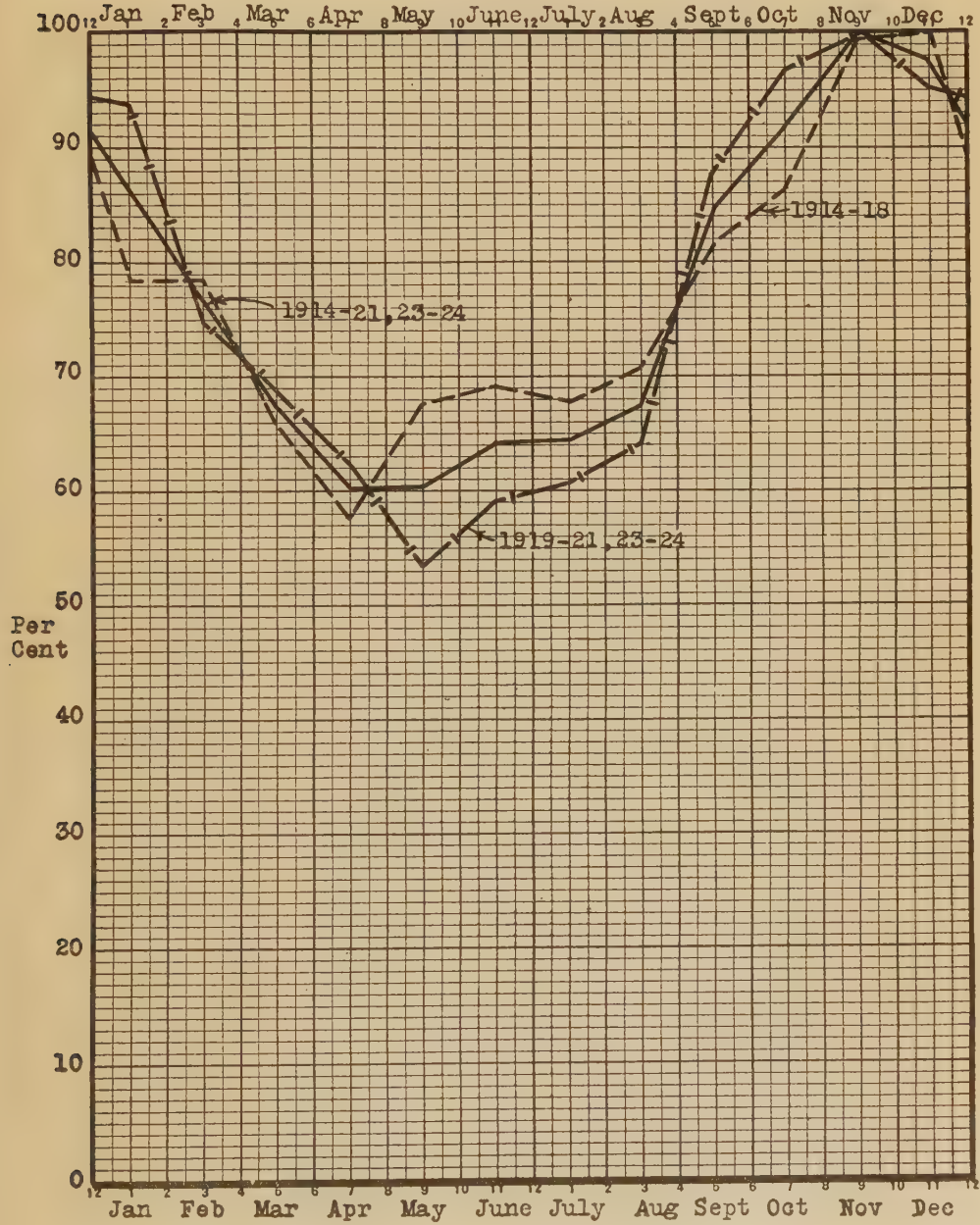


CHART L
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION **FRANKLIN COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

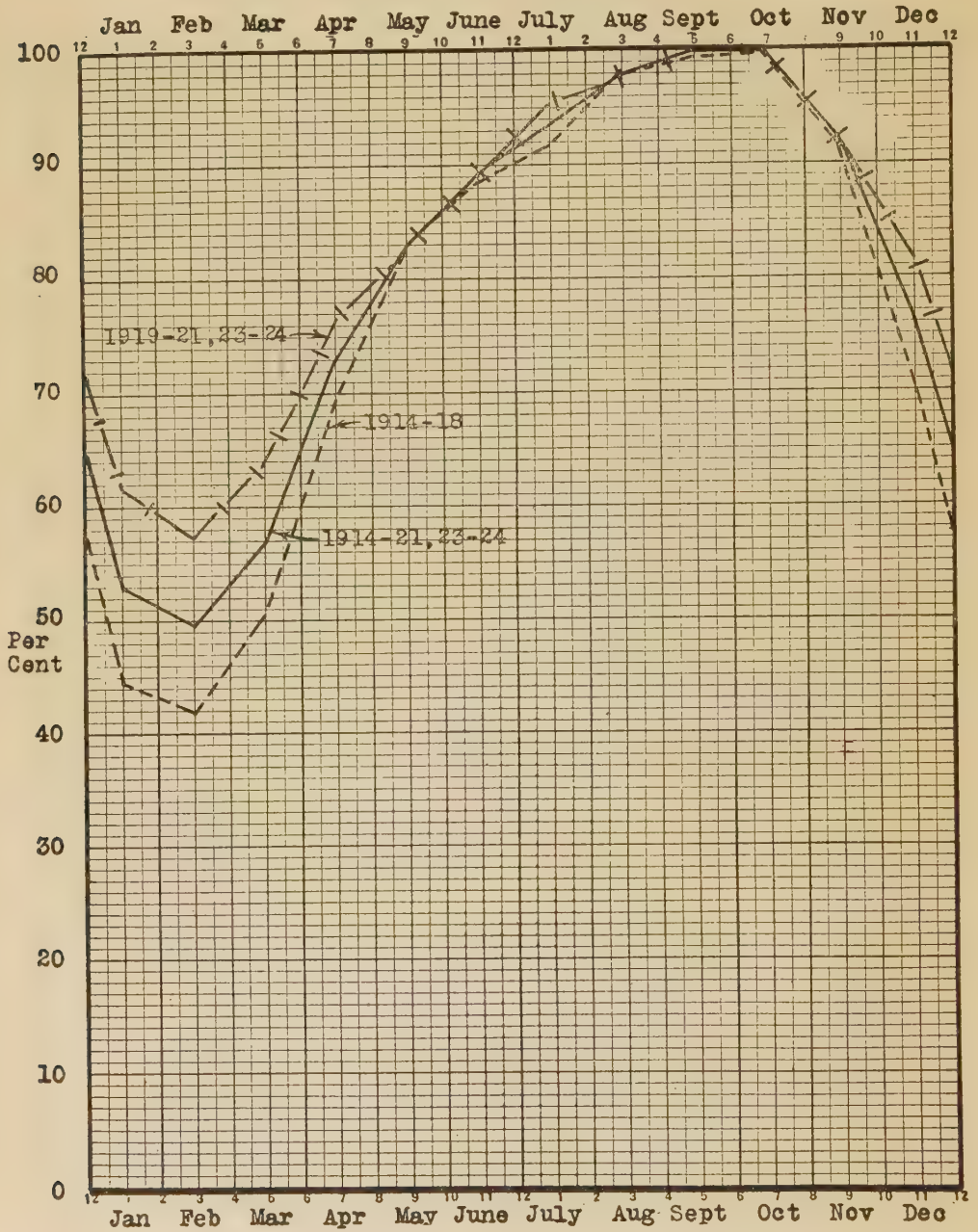


CHART LI

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS BRICK, STONE AND CEMENT WORK FRANKLIN COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

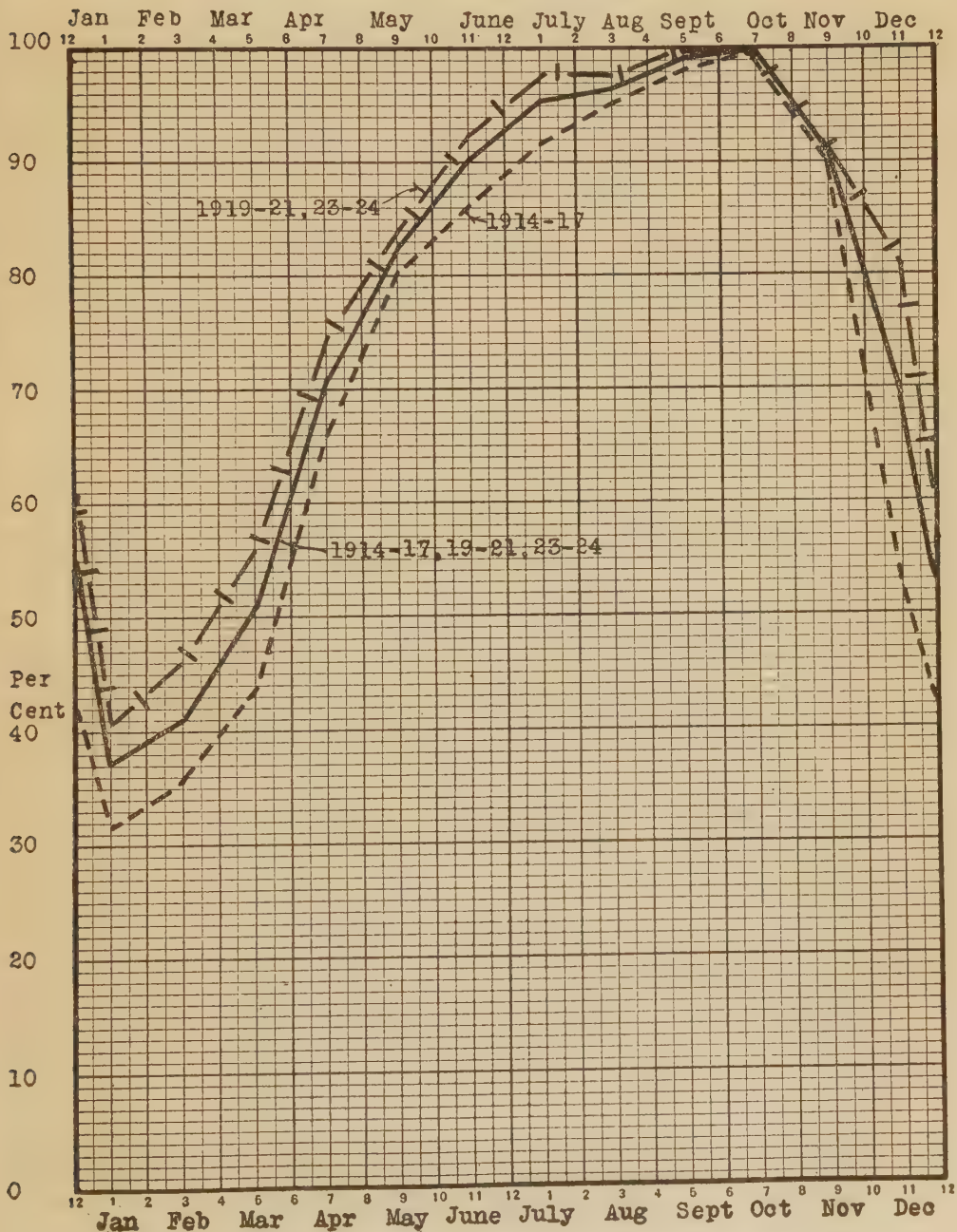


CHART LII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ELECTRICAL CONTRACTING **FRANKLIN COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

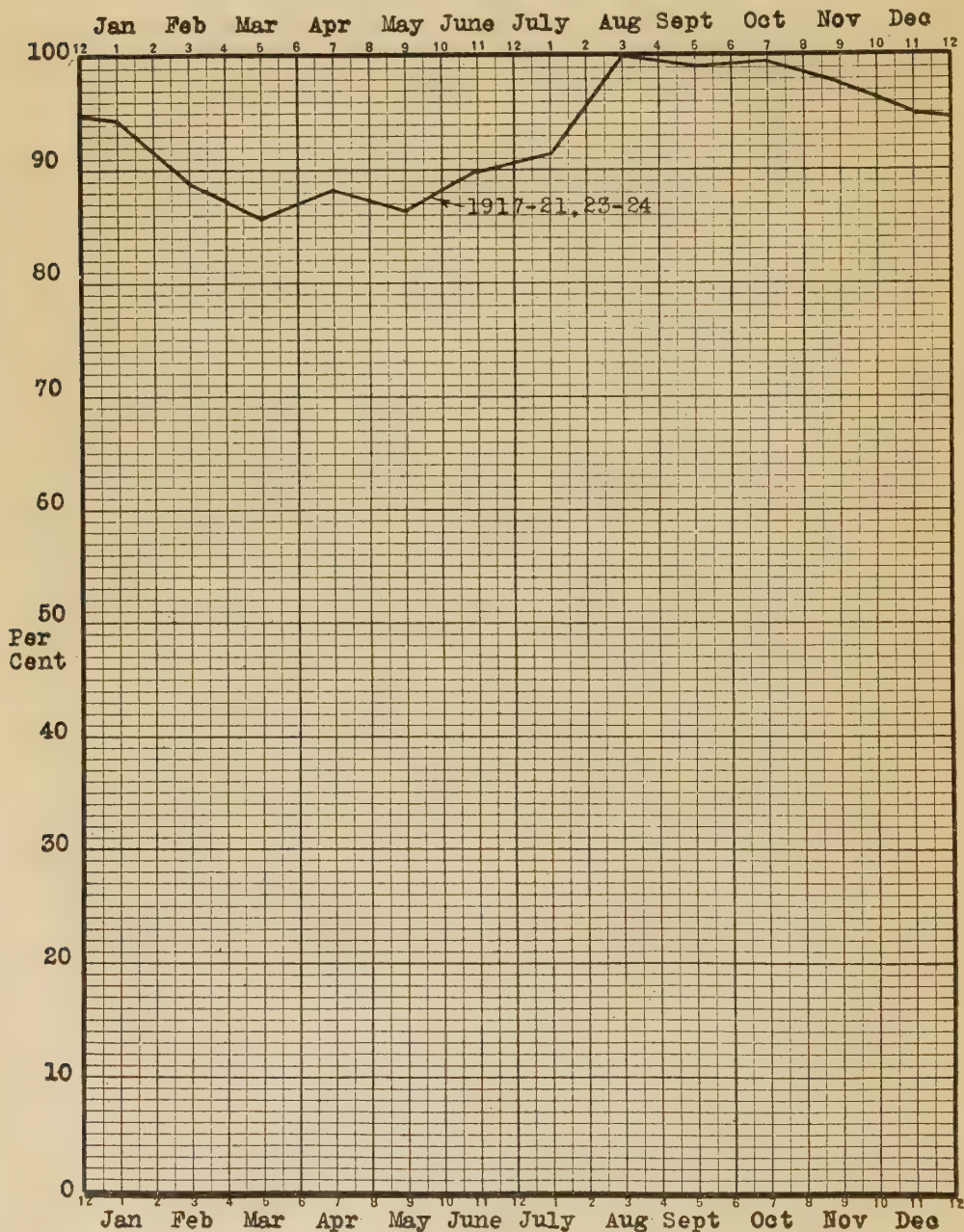


CHART LIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
GENERAL CONTRACTING **FRANKLIN COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

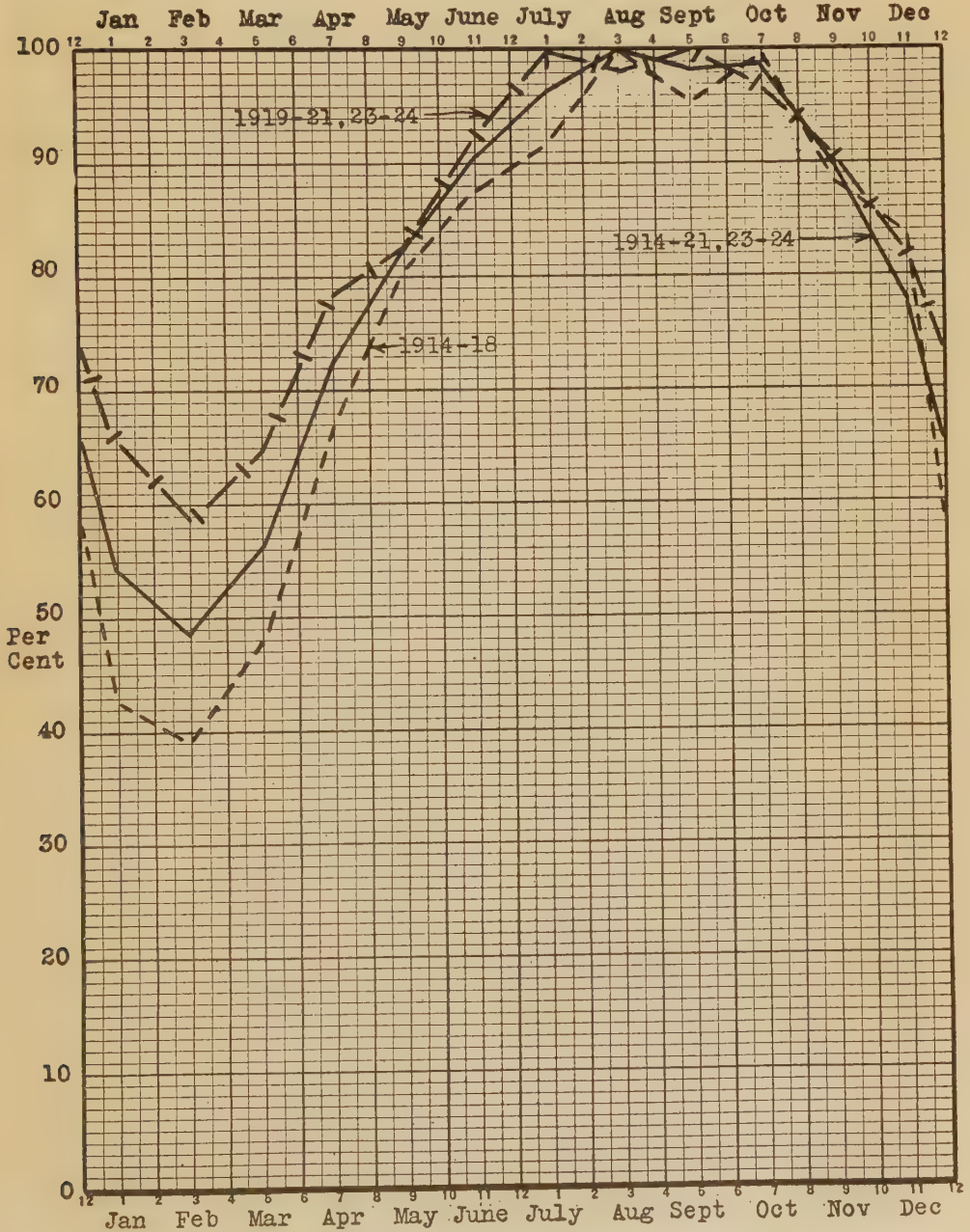


CHART LIV
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 PAINTING AND DECORATING
 FRANKLIN COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

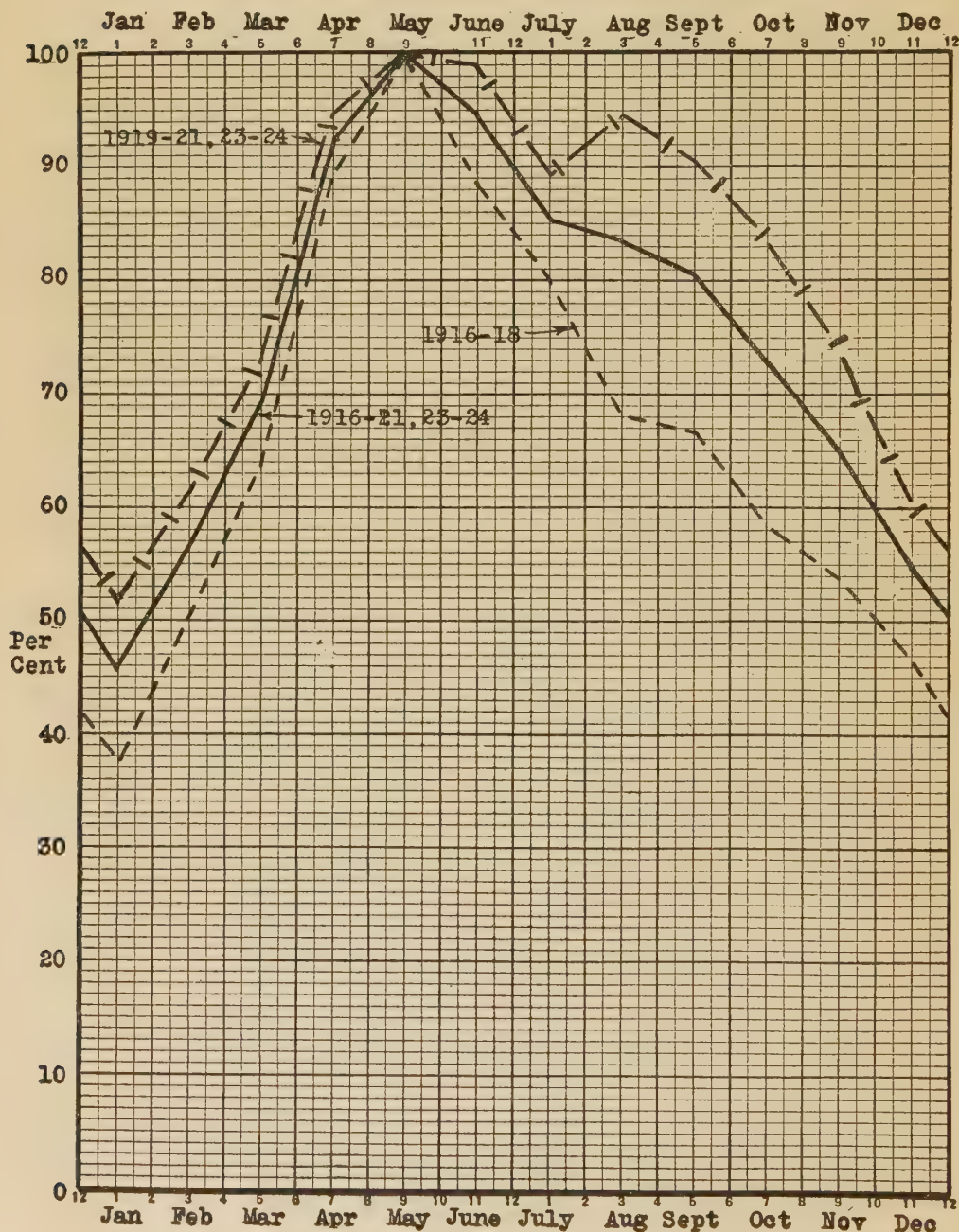


CHART LV

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS PLASTERING AND LATHING FRANKLIN COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

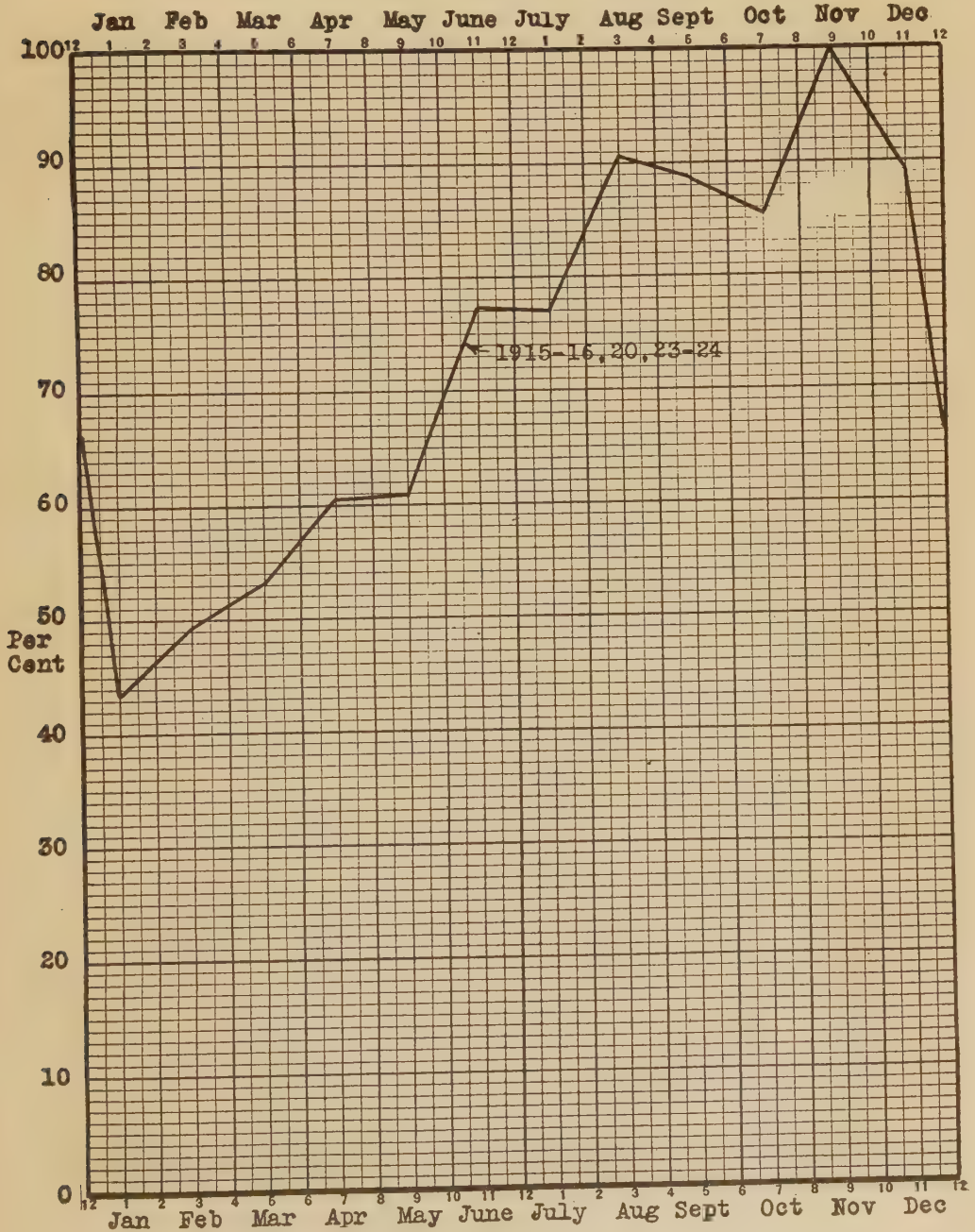


CHART LVI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PLUMBING AND STEAM FITTING **FRANKLIN COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

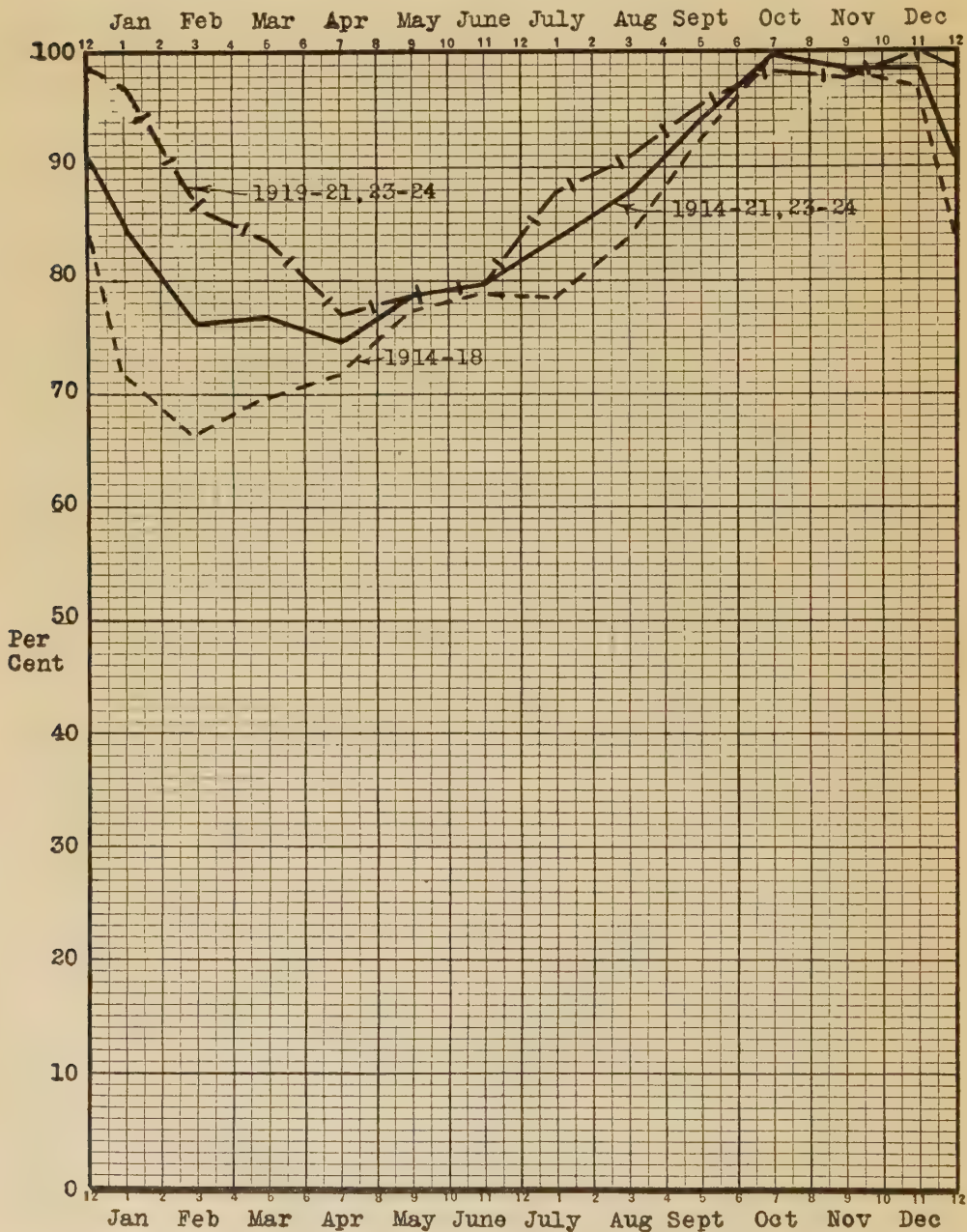


CHART LVII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS SHEET METAL WORK AND ROOFING

FRANKLIN COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

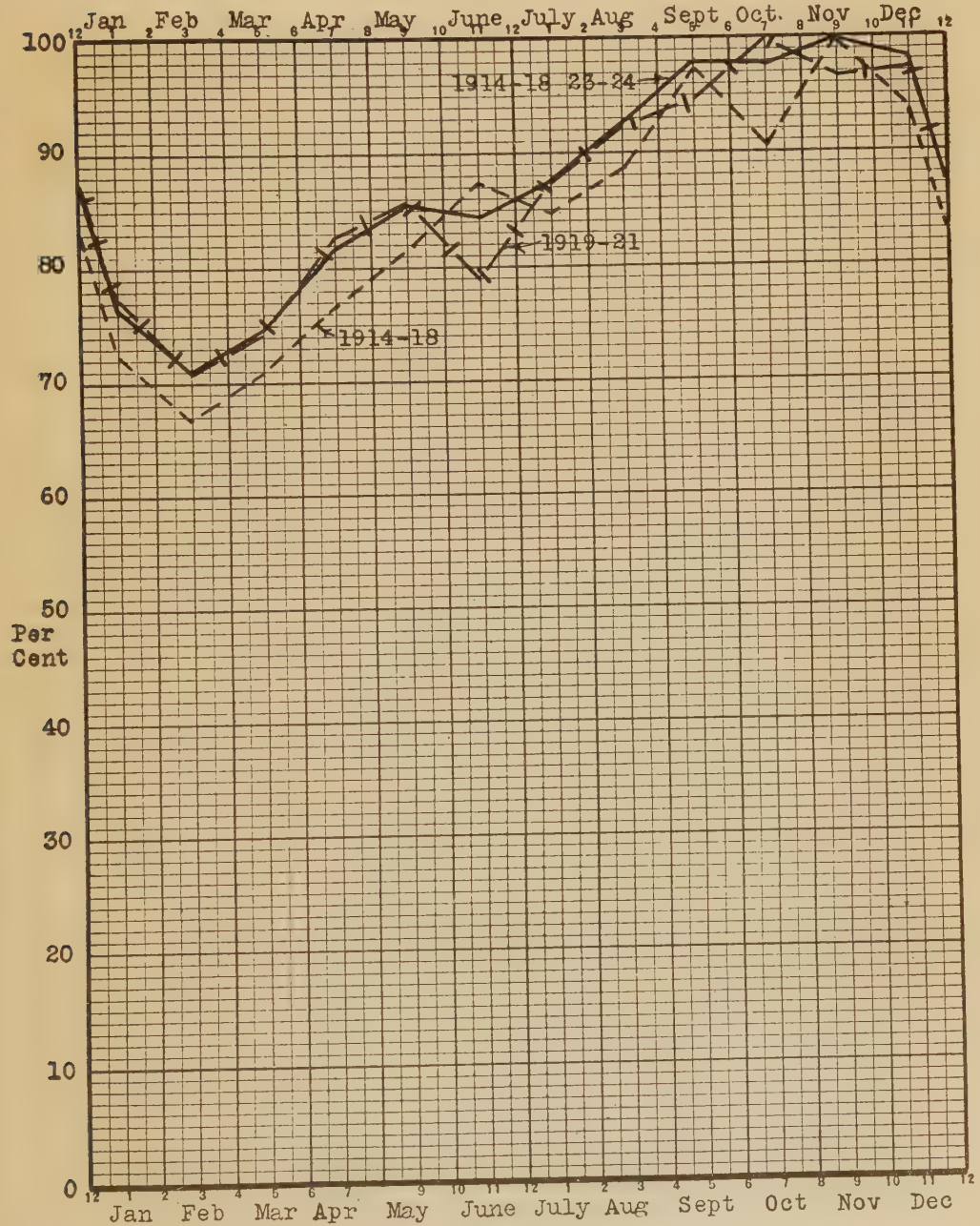


CHART LVIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
STREET, ROAD AND SEWER CONTRACTING FRANKLIN COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

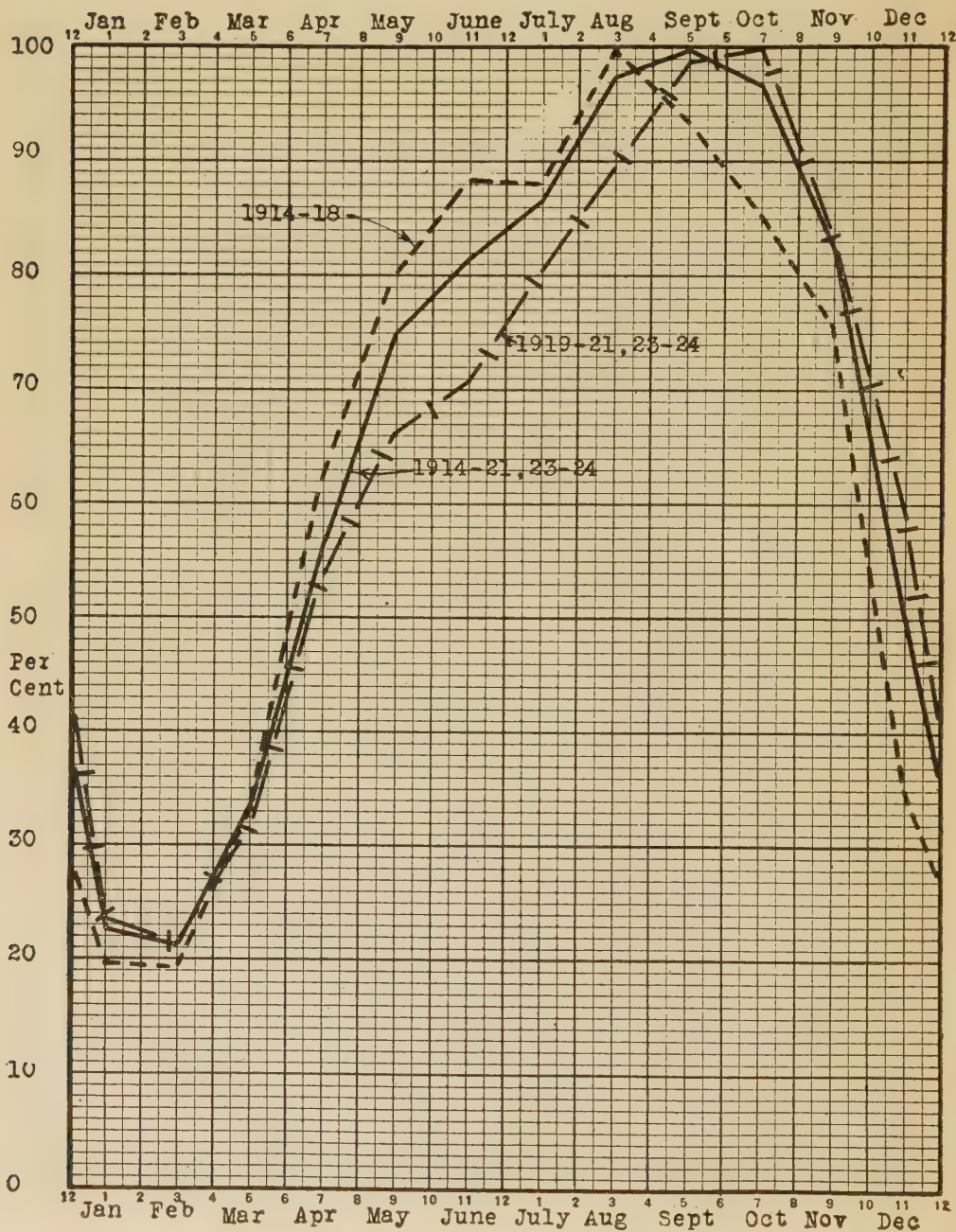


CHART LIX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION HAMILTON COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

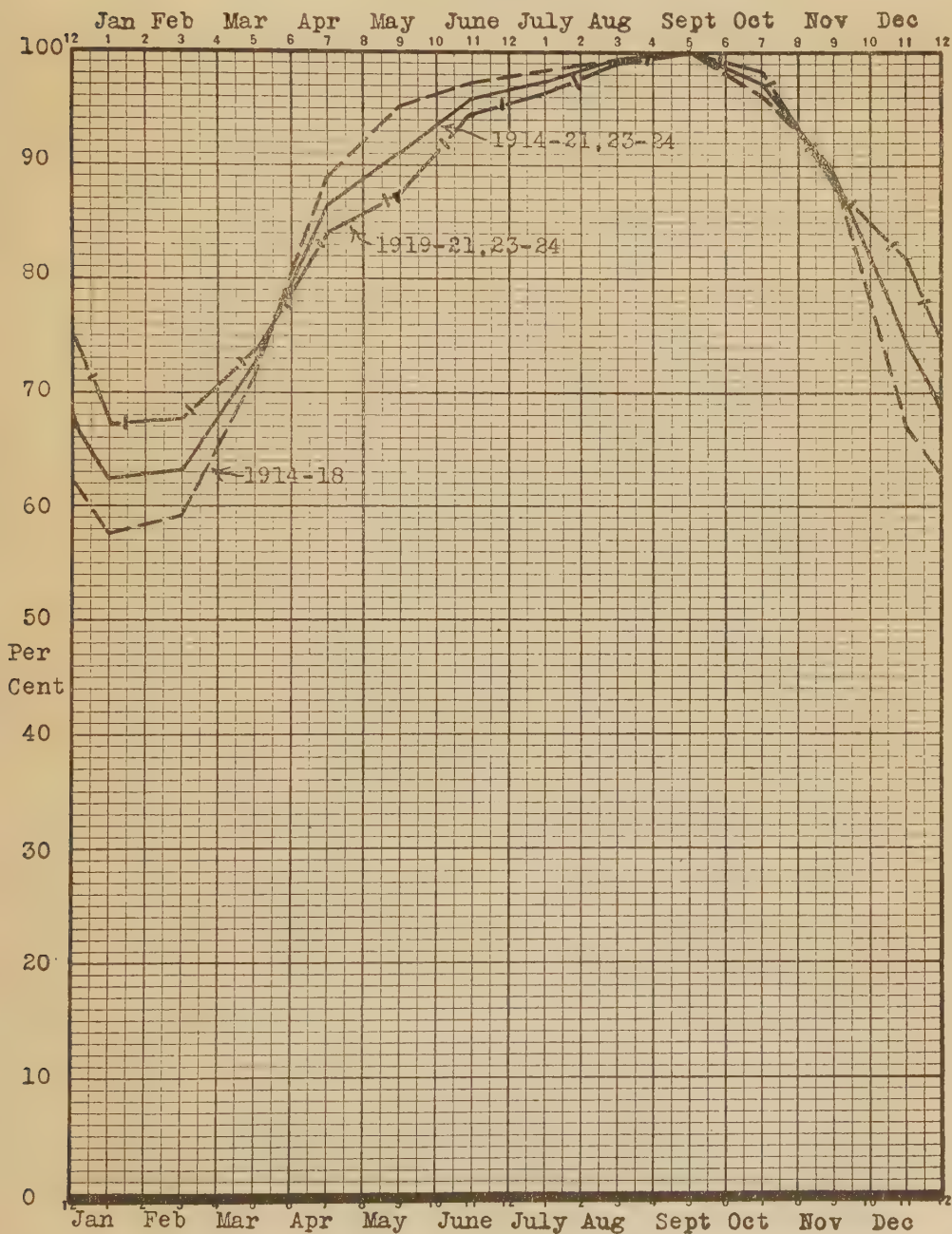


CHART LX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
BRICK, STONE, AND CEMENT WORK **HAMILTON COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

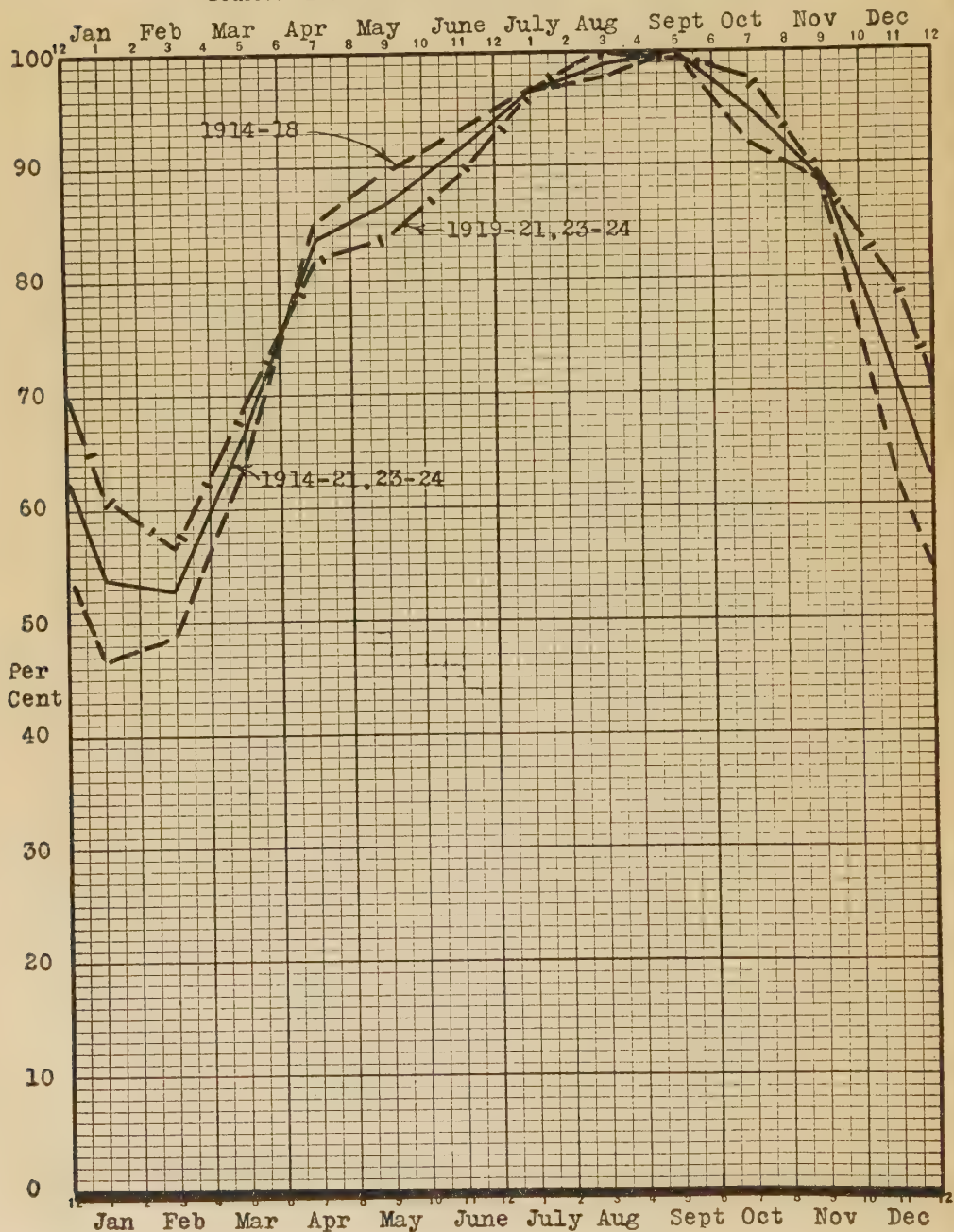


CHART LXI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ELECTRICAL CONTRACTING **HAMILTON COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

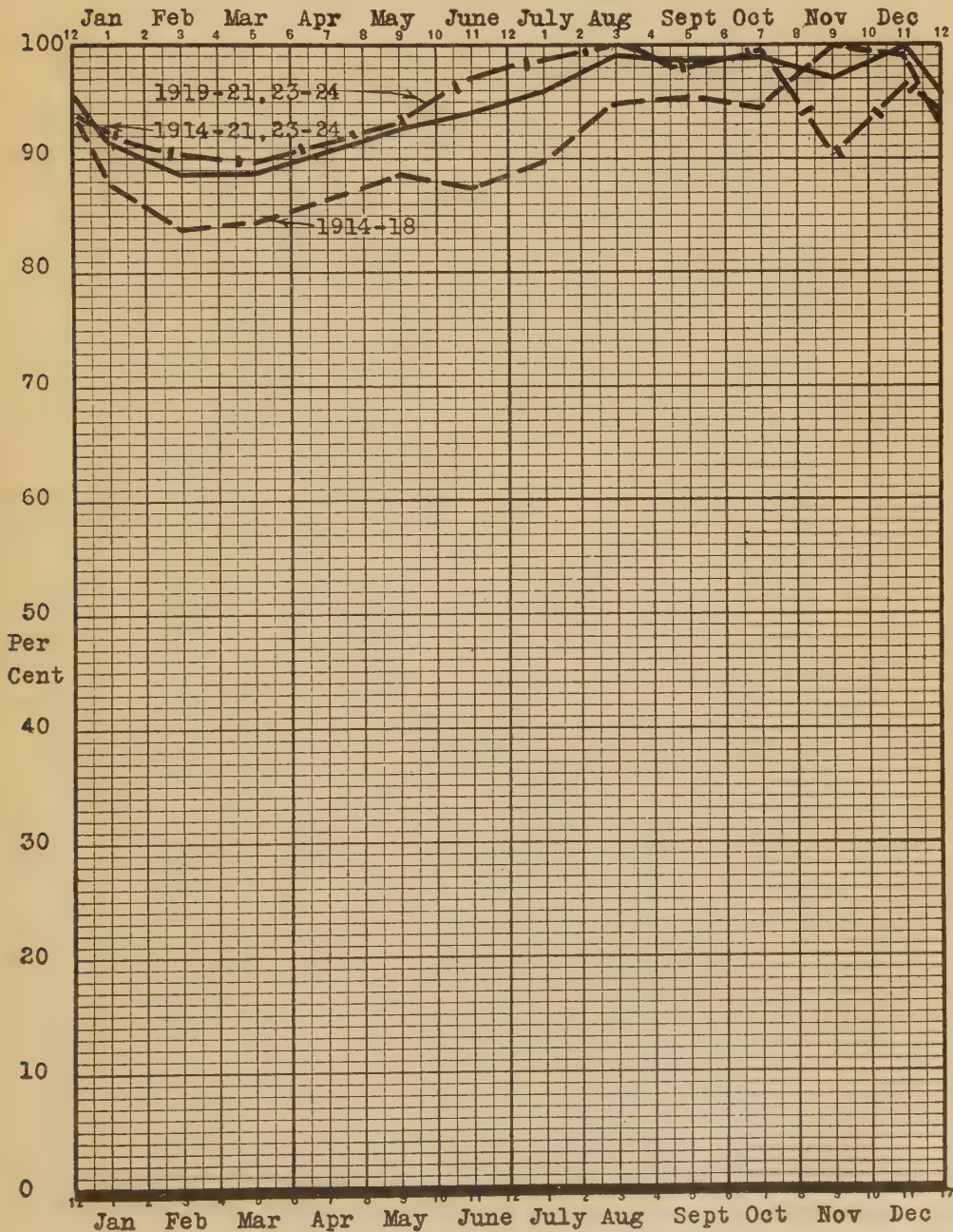


CHART LXII
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 GENERAL CONTRACTING HAMILTON COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

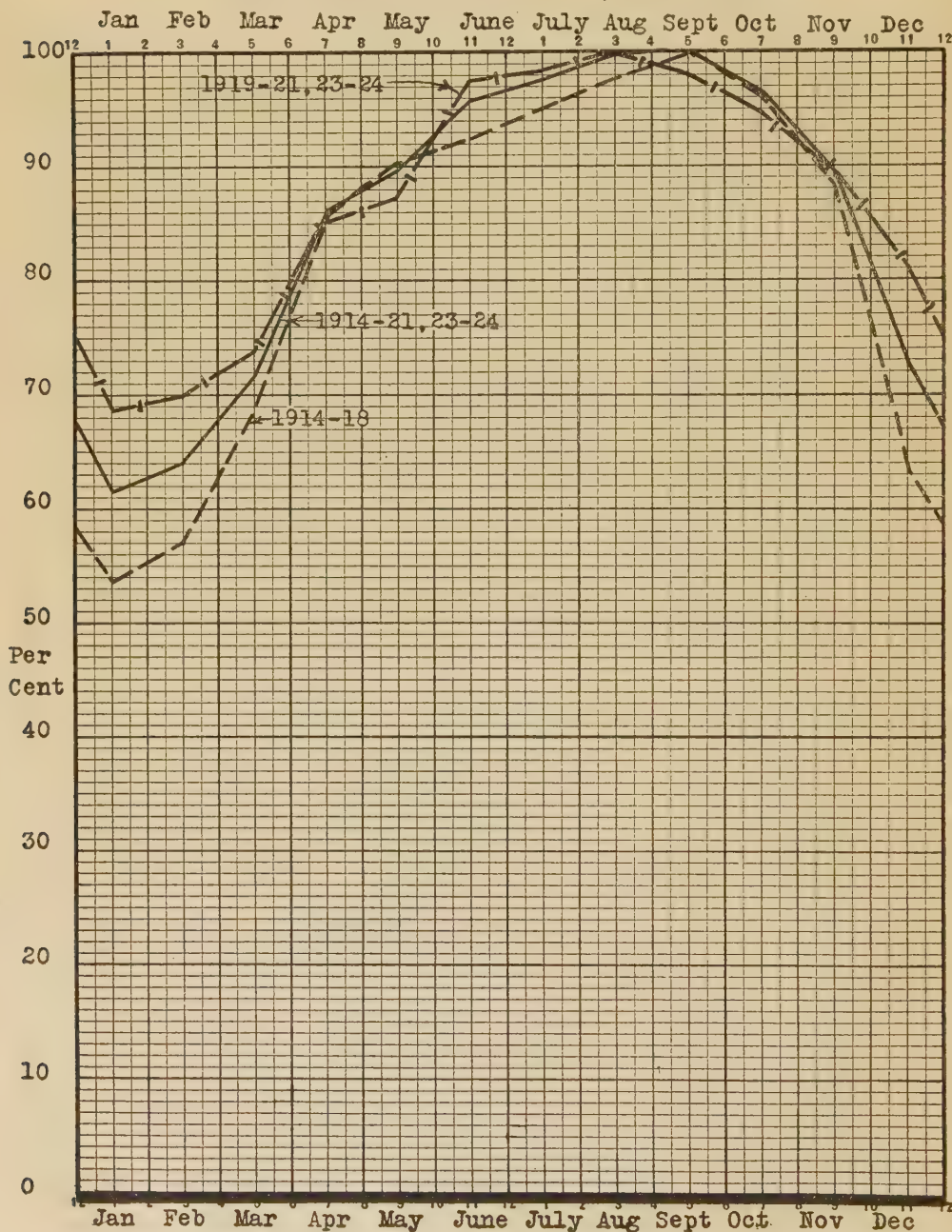


CHART LXIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PAINTING AND DECORATING
HAMILTON COUNTY, OHIO
Month of Greatest Employment in Each Series Equals 100
Source: Division of Labor Statistics, State of Ohio

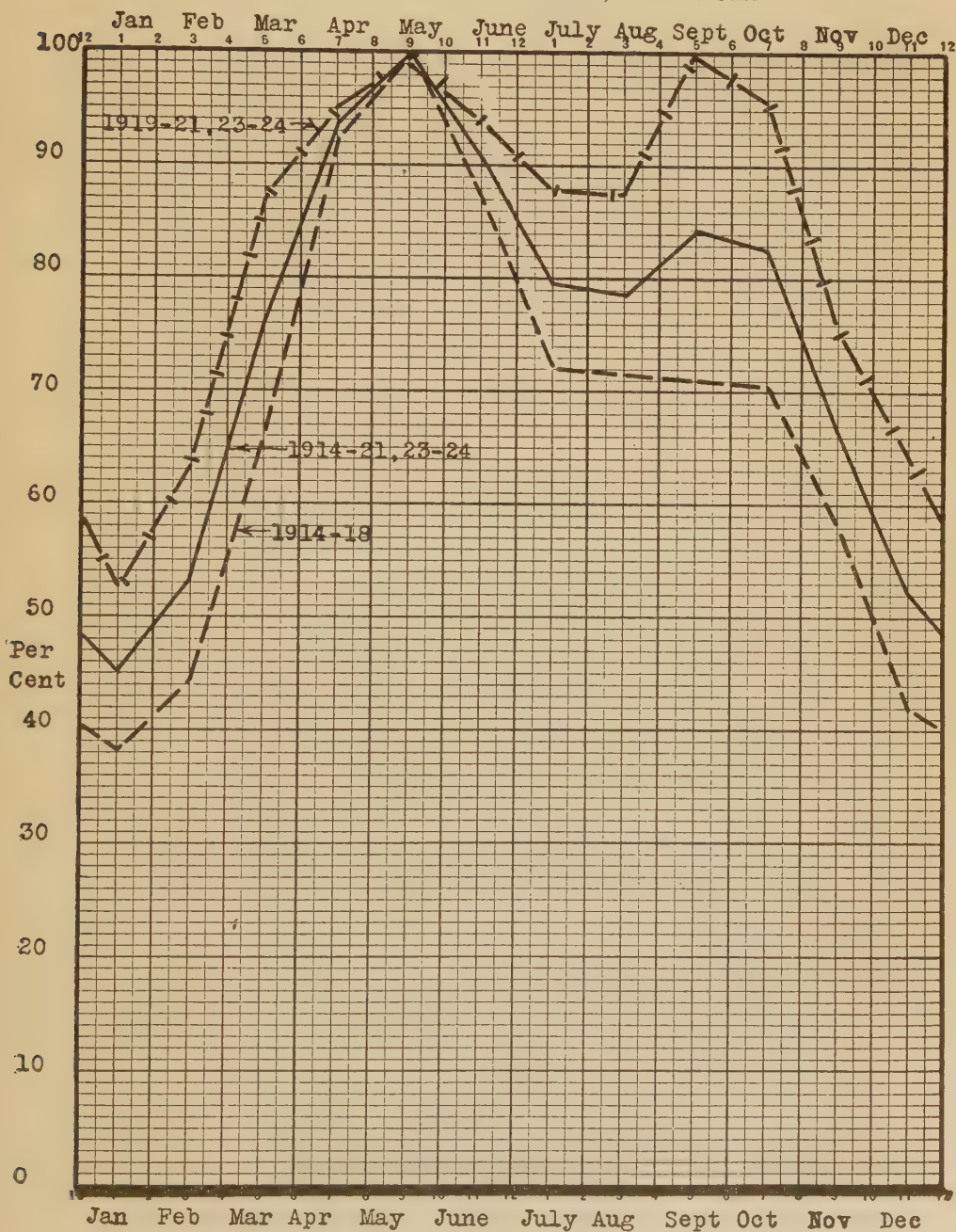


CHART LXIV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PLASTERING AND LATHING **HAMILTON COUNTY, OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

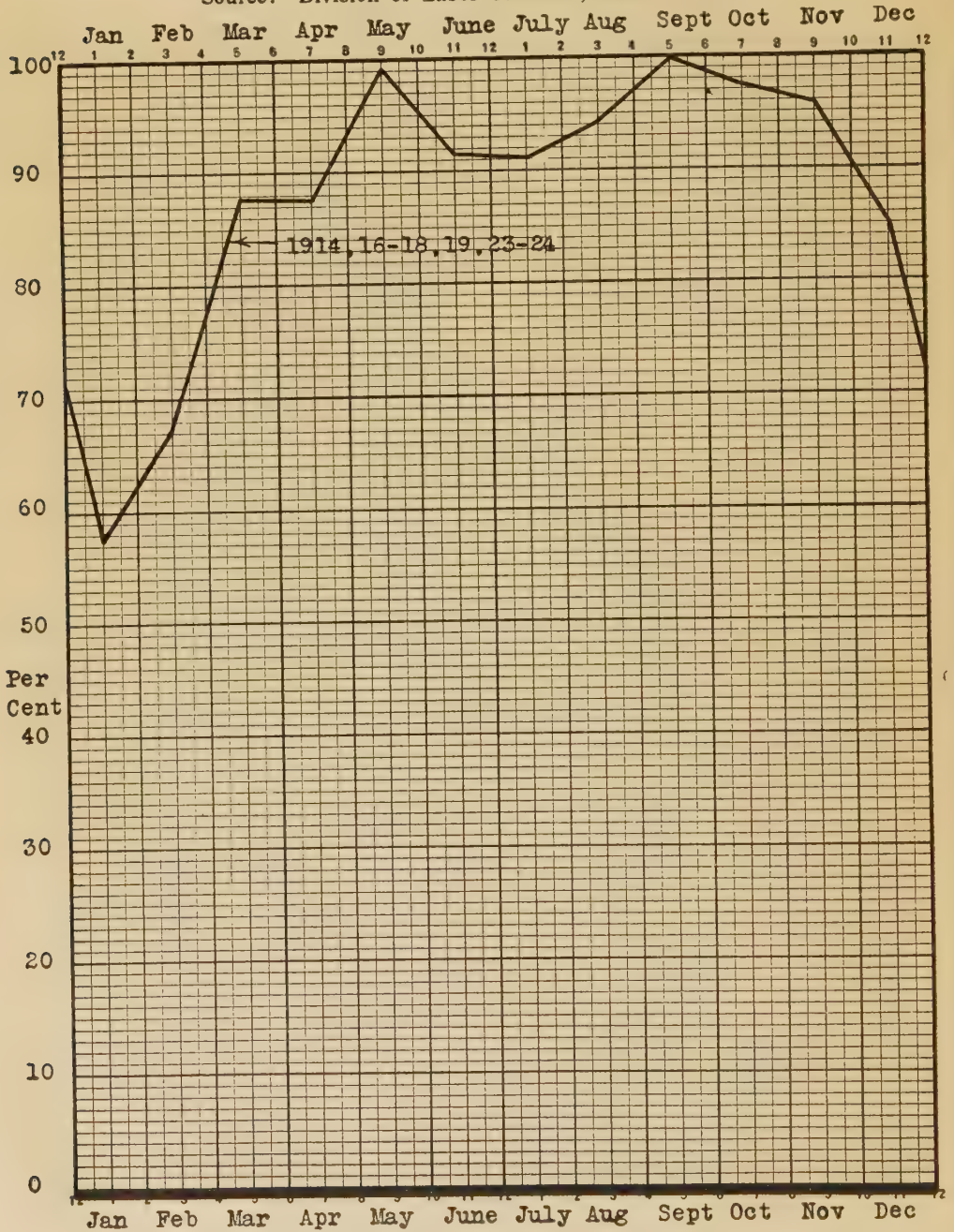


CHART LXV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PLUMBING AND STEAM FITTING **HAMILTON COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

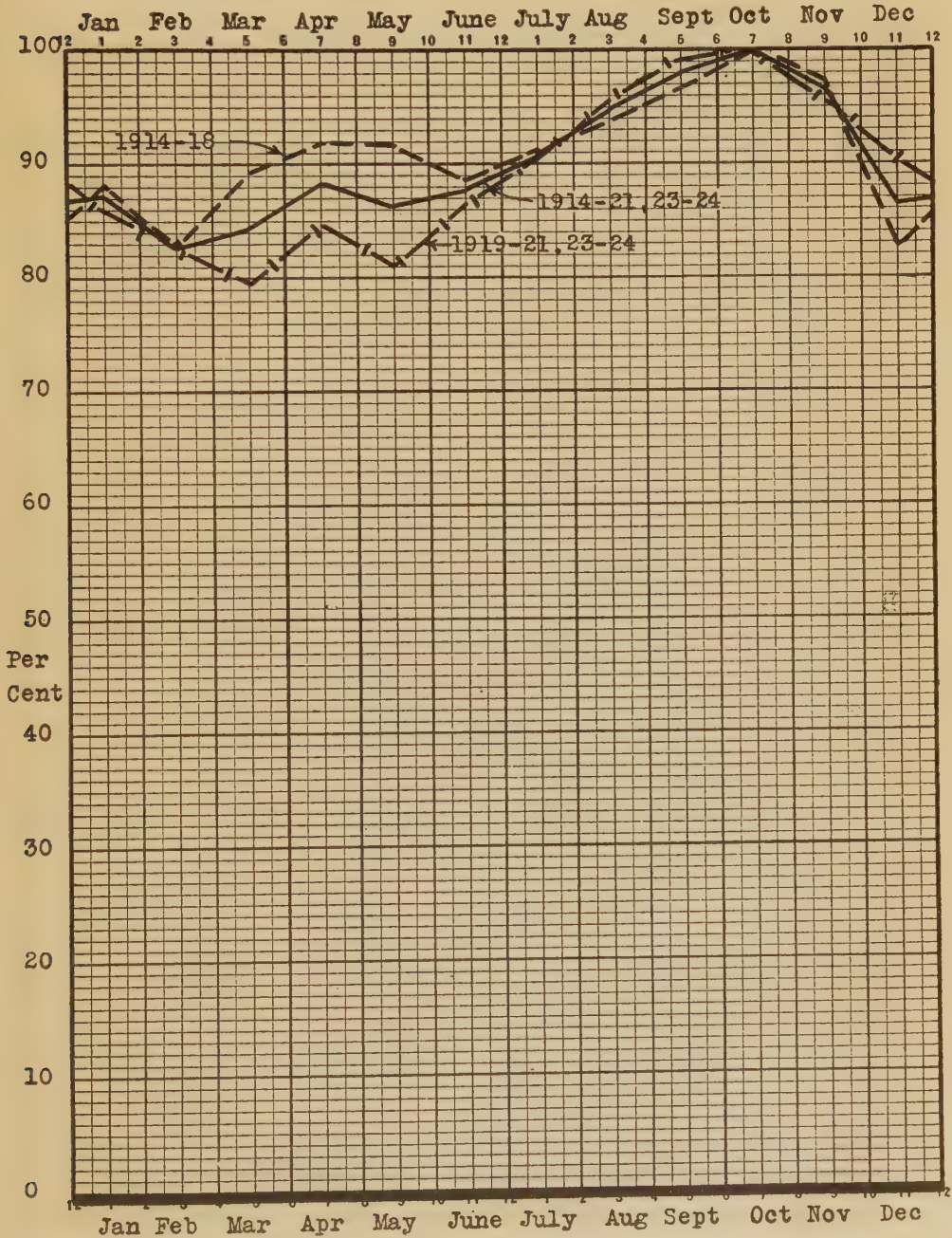


CHART LXVI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
SAND AND GRAVEL EXCAVATING **HAMILTON COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

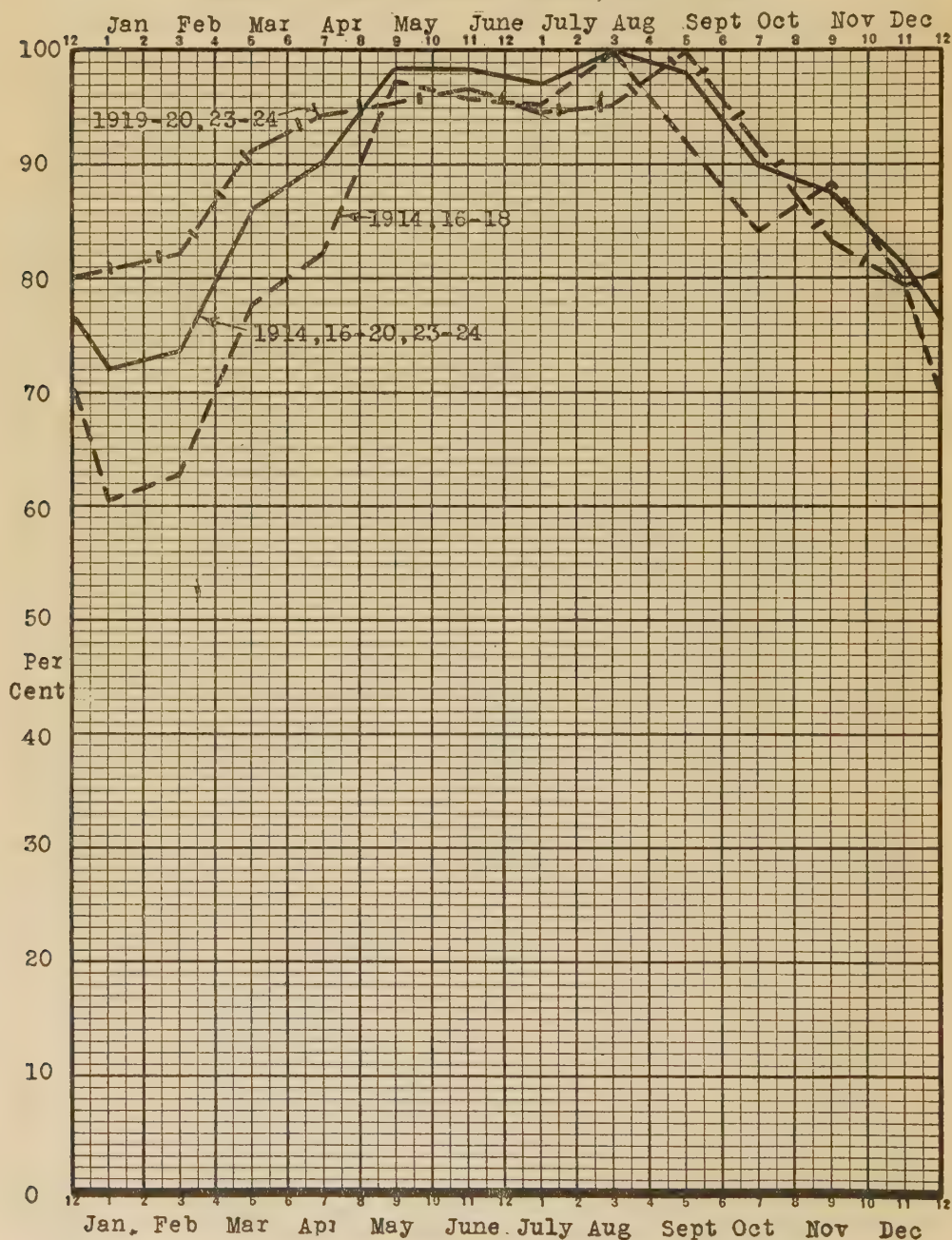


CHART LXVII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS SHEET METAL WORK AND ROOFING HAMILTON COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

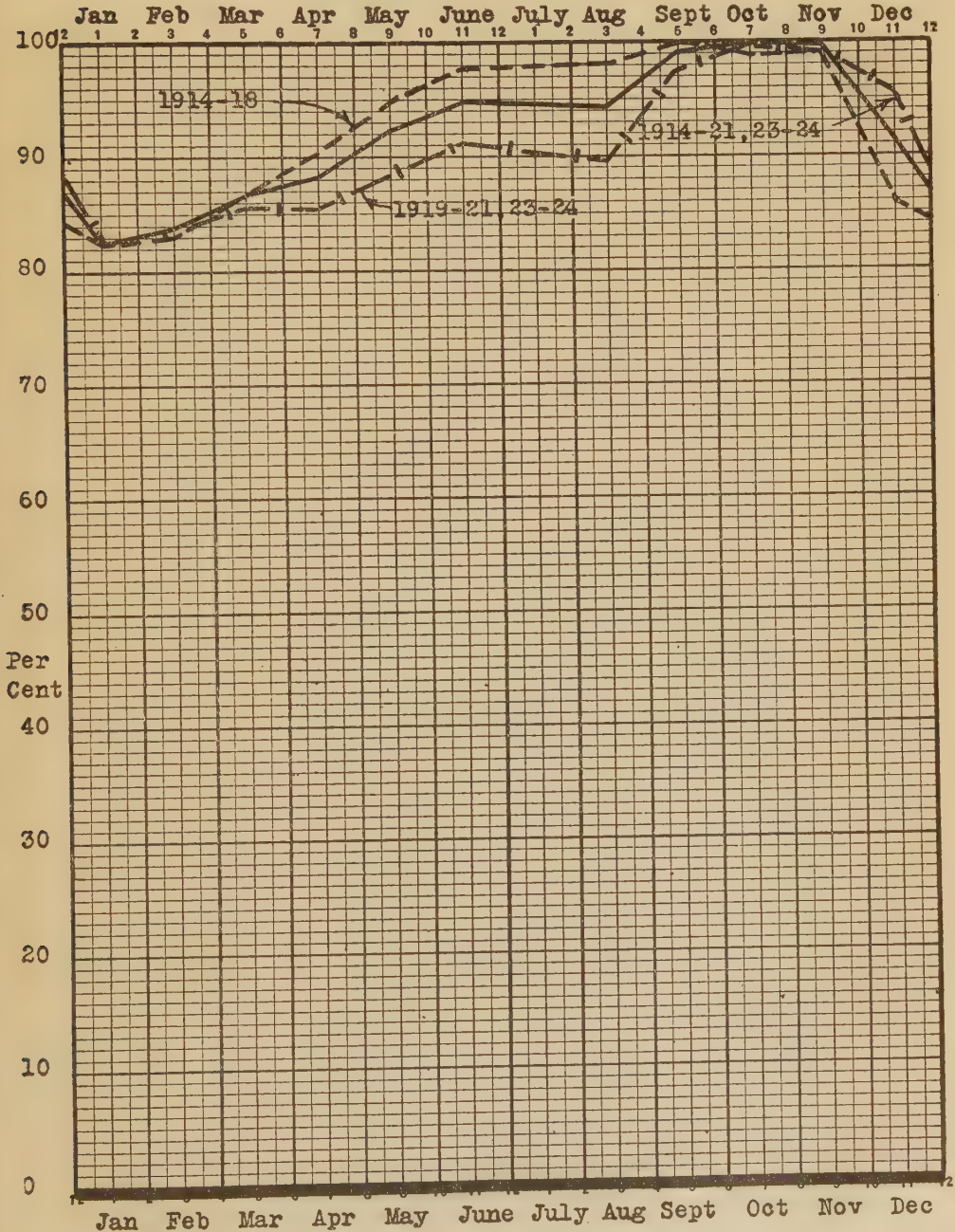


CHART LXVIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
STREET, ROAD, AND SEWER CONTRACTING HAMILTON COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

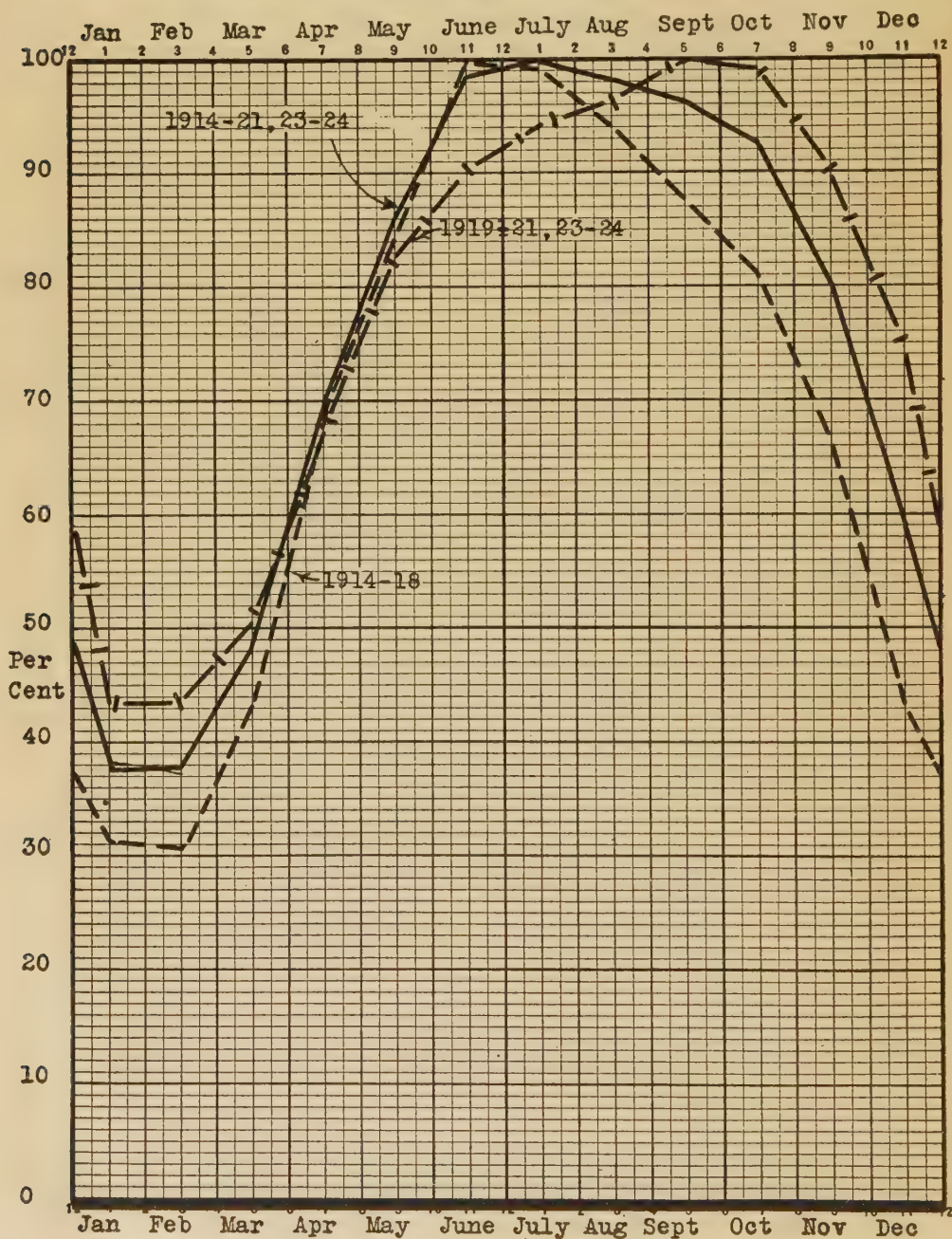


CHART LXIX

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS

VENTILATING AND HEATING

HAMILTON COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

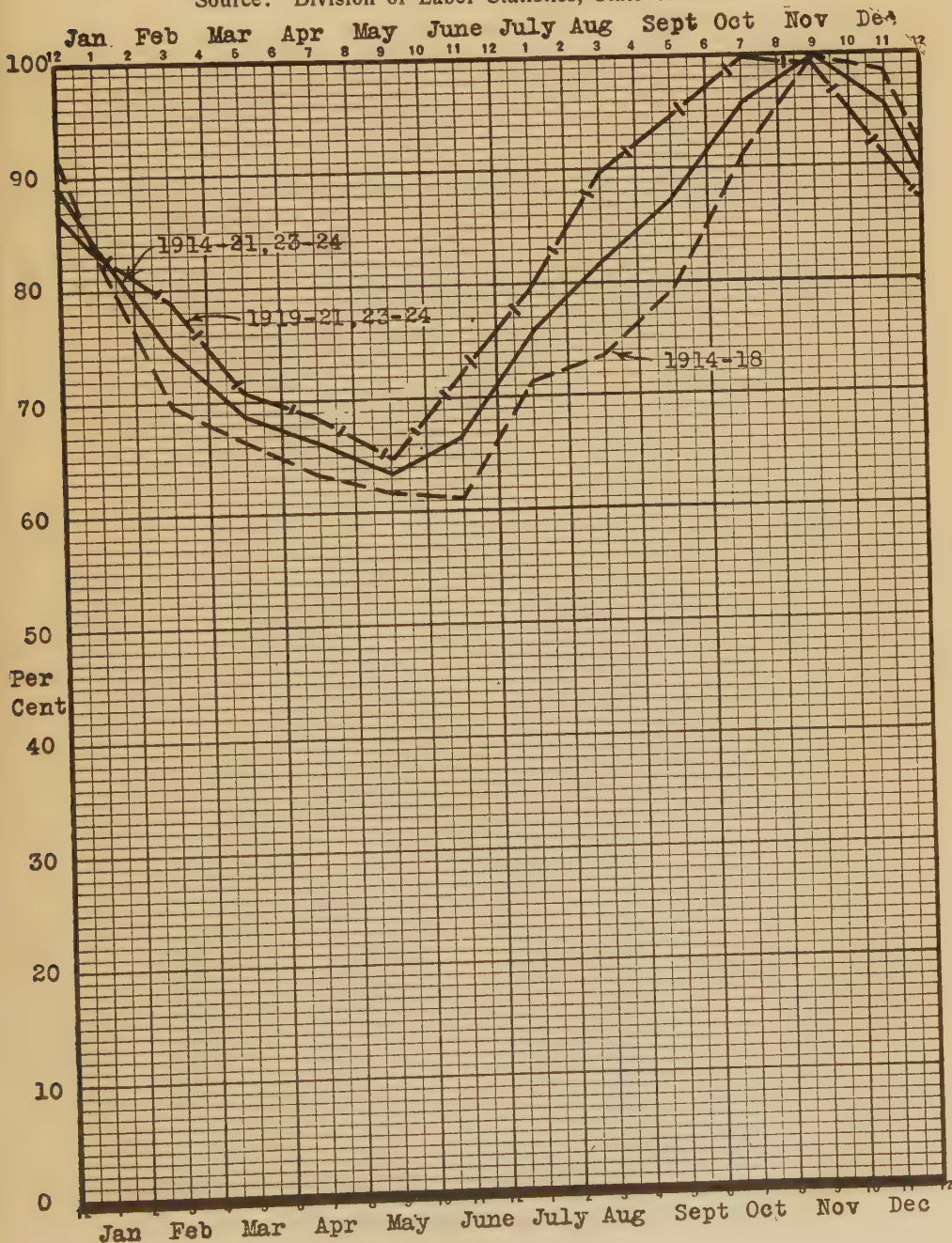


CHART LXX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION **LUCAS COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

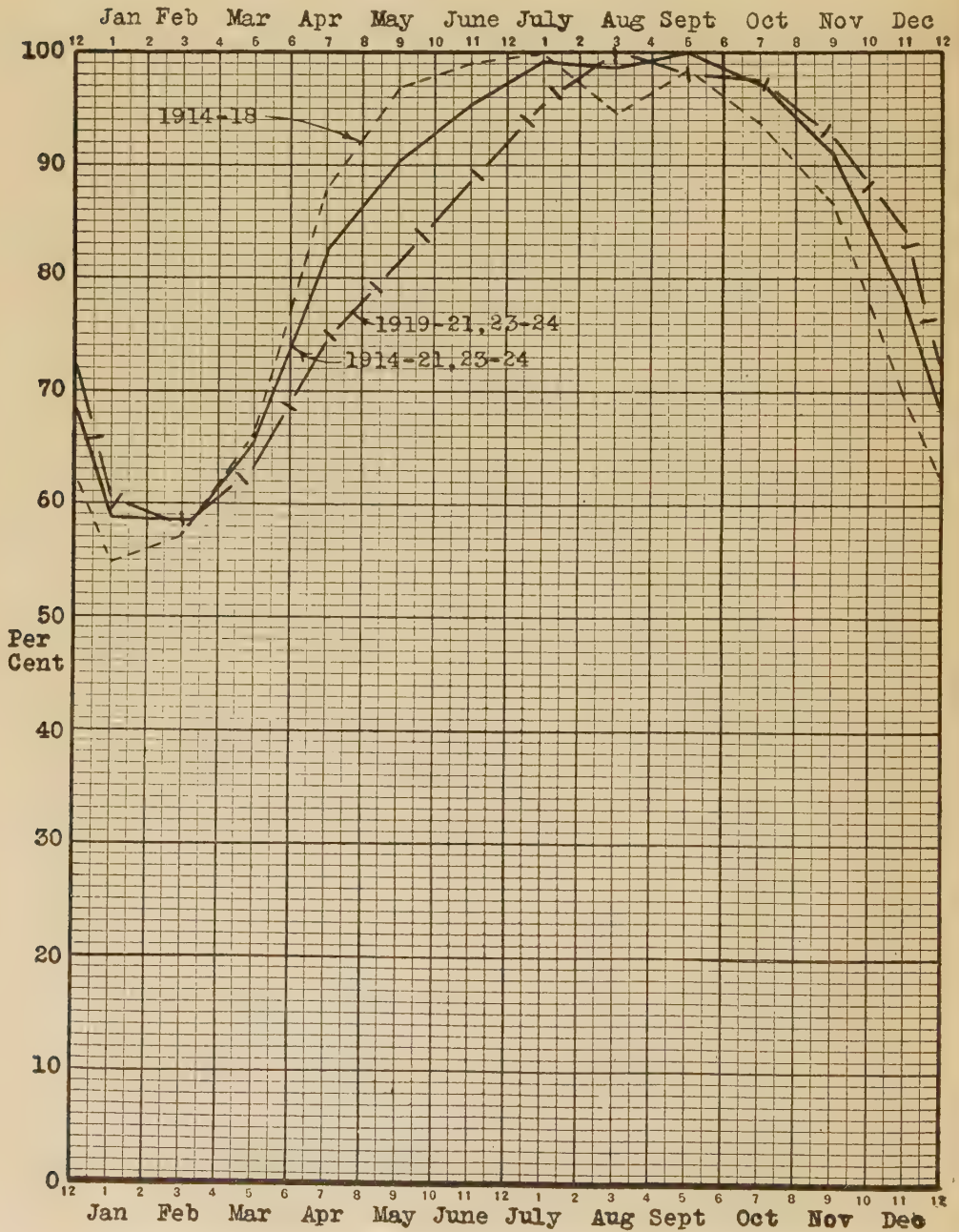


CHART LXXI

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS

BRICK, STONE AND CEMENT WORK

LUCAS COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

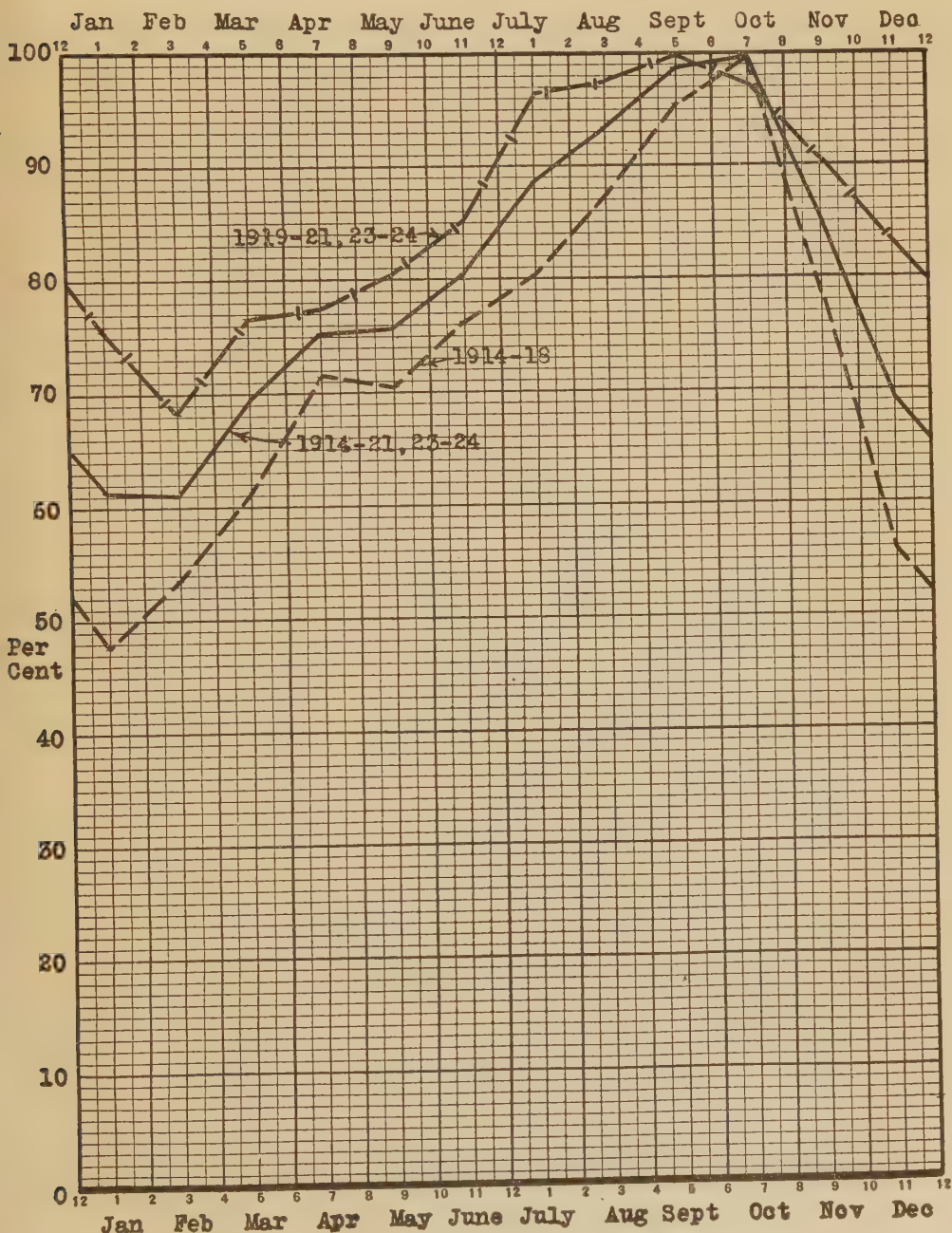


CHART LXXII
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 ELECTRICAL CONTRACTING LUCAS COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

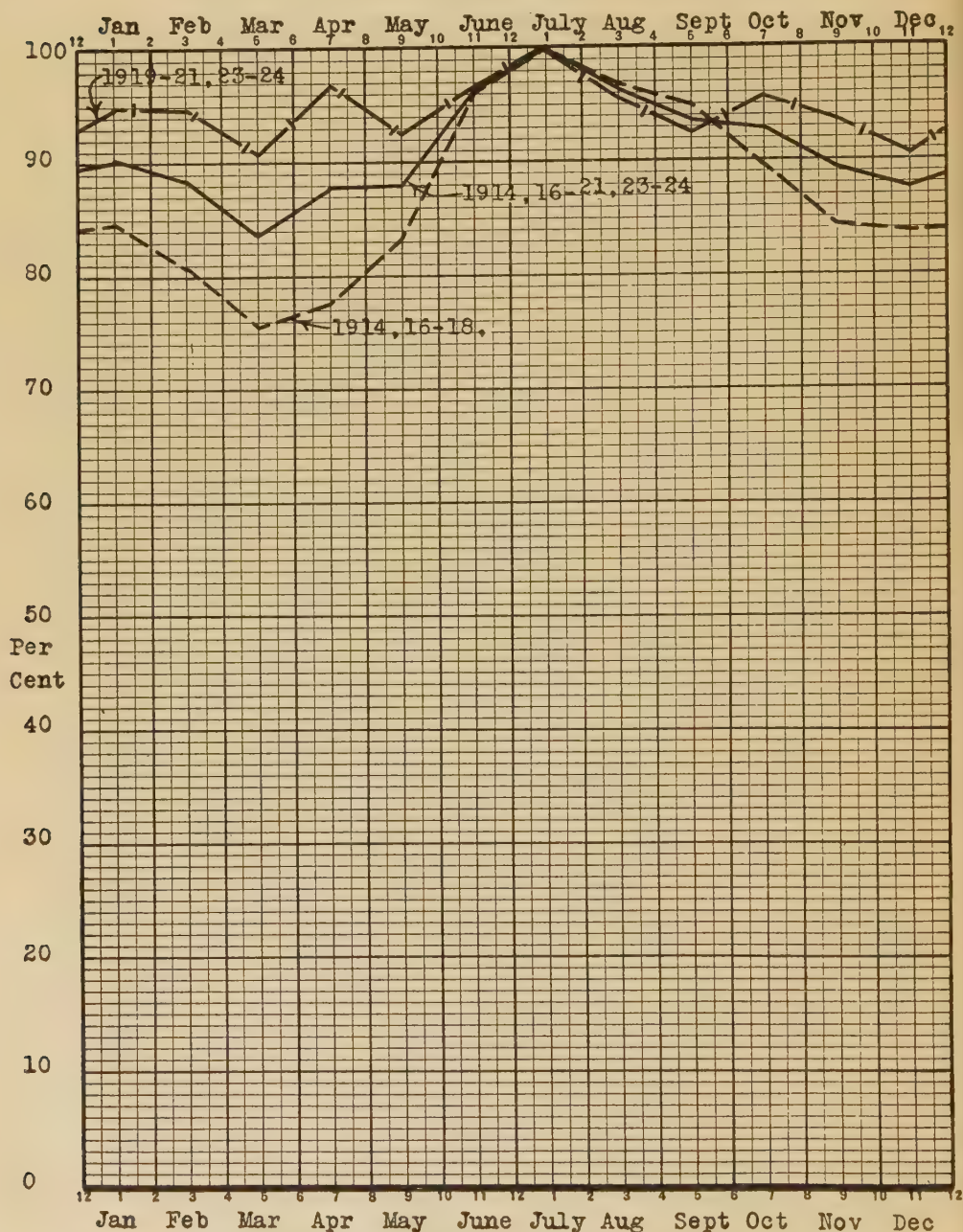


CHART LXXIII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS GENERAL CONTRACTING LUCAS COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

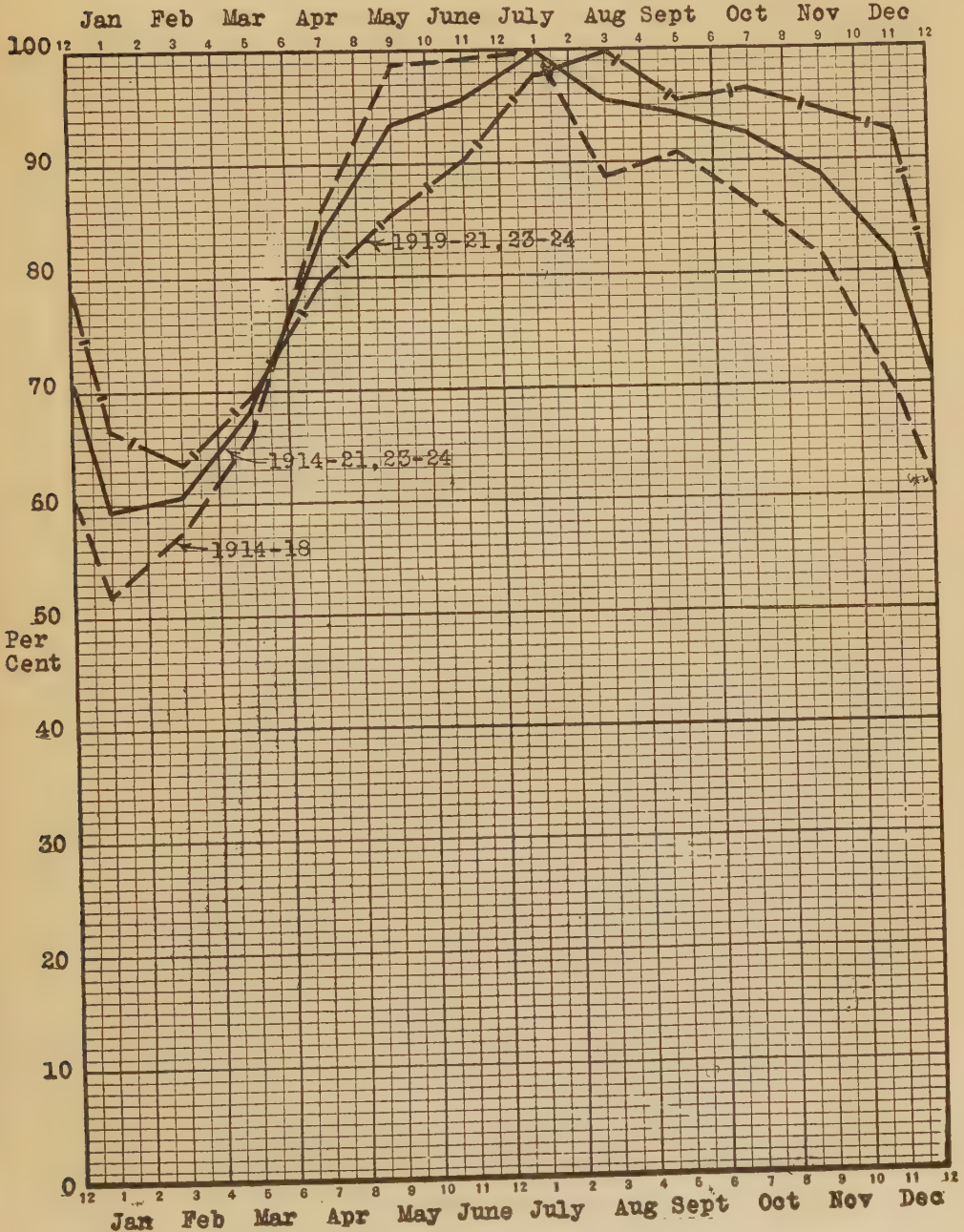


CHART LXXIV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PAINTING AND DECORATING **LUCAS COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

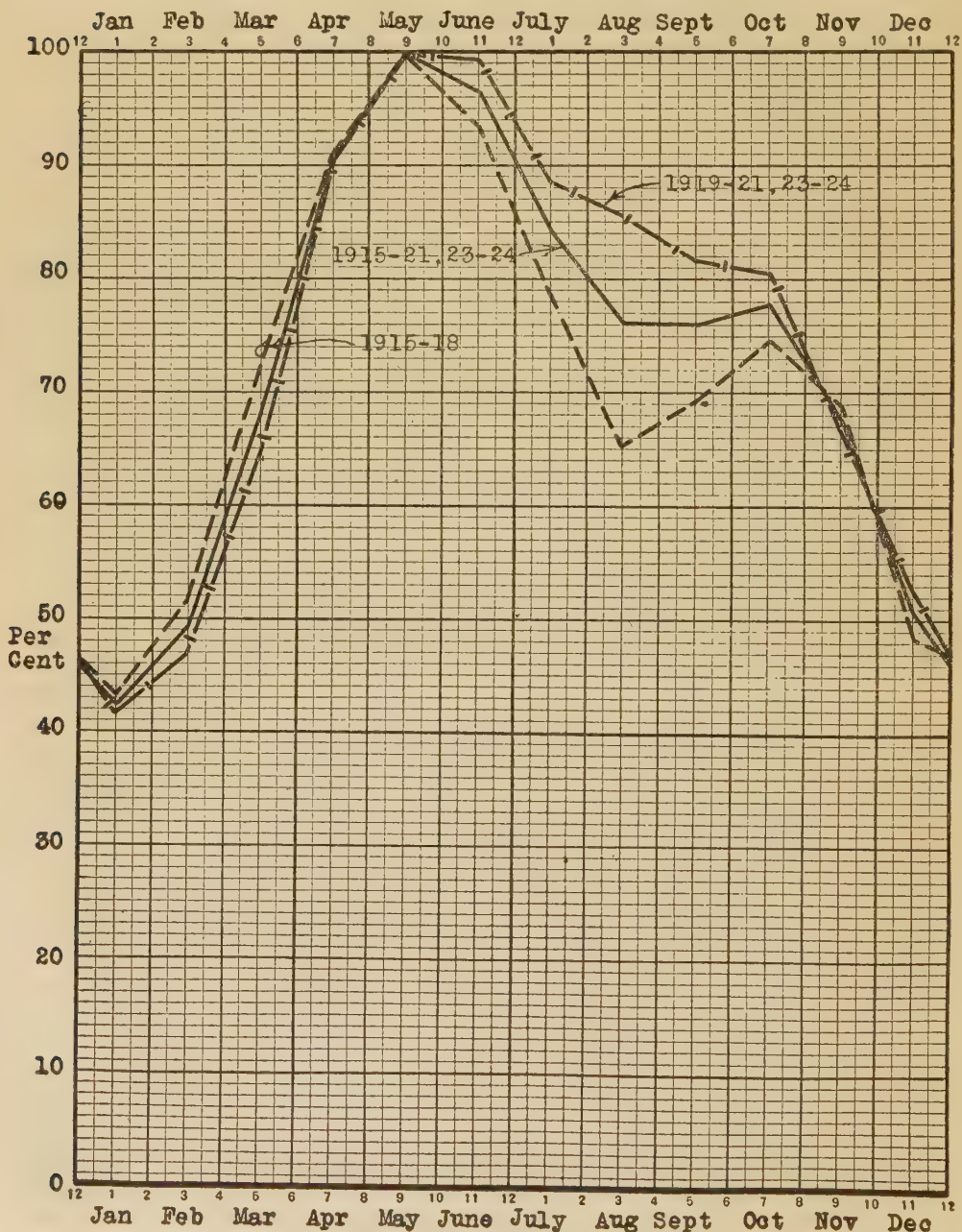


CHART LXXV

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS PLUMBING AND STEAM FITTING LUCAS COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

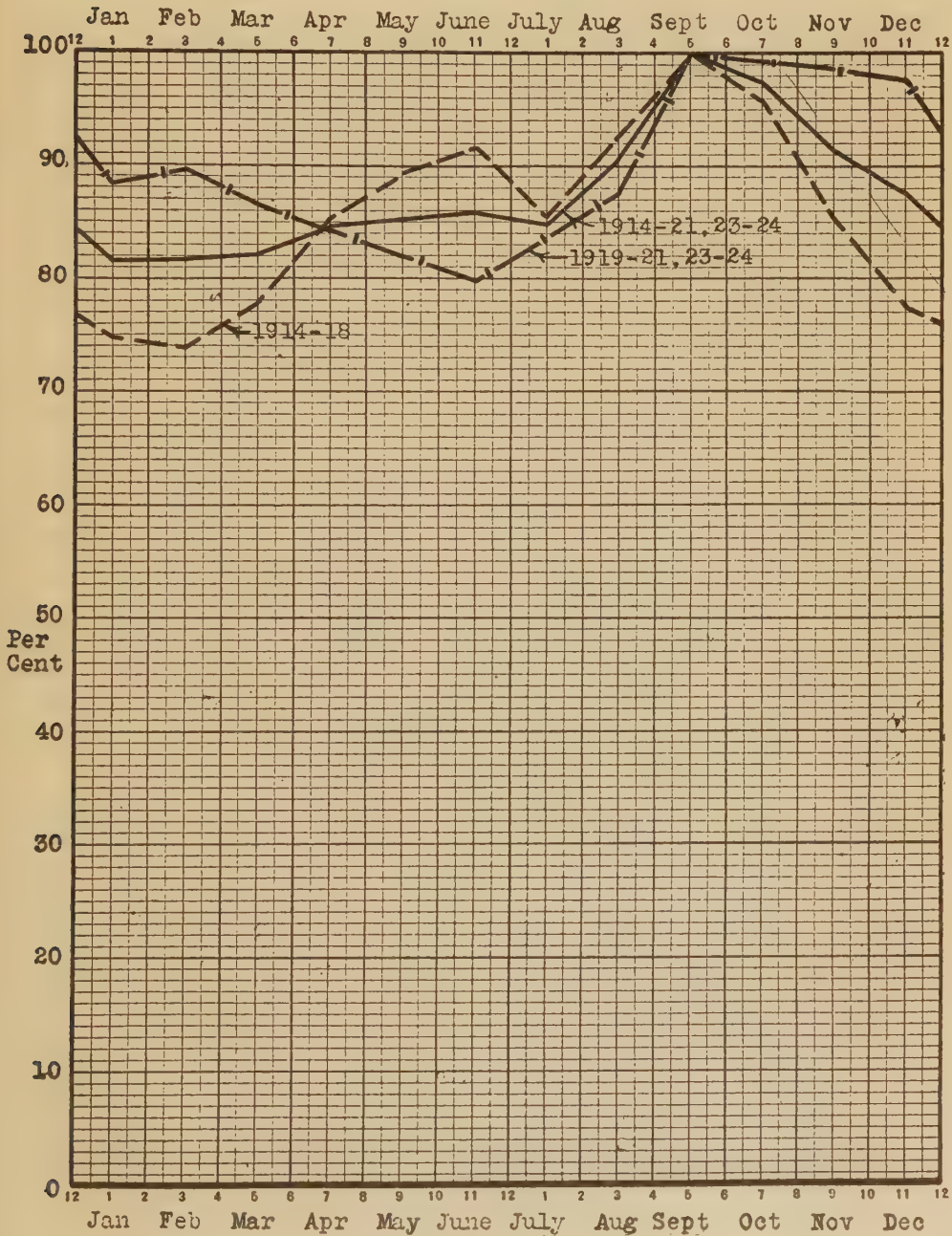


CHART LXXVI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ROOFING AND SHEET METAL WORK **LUCAS COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

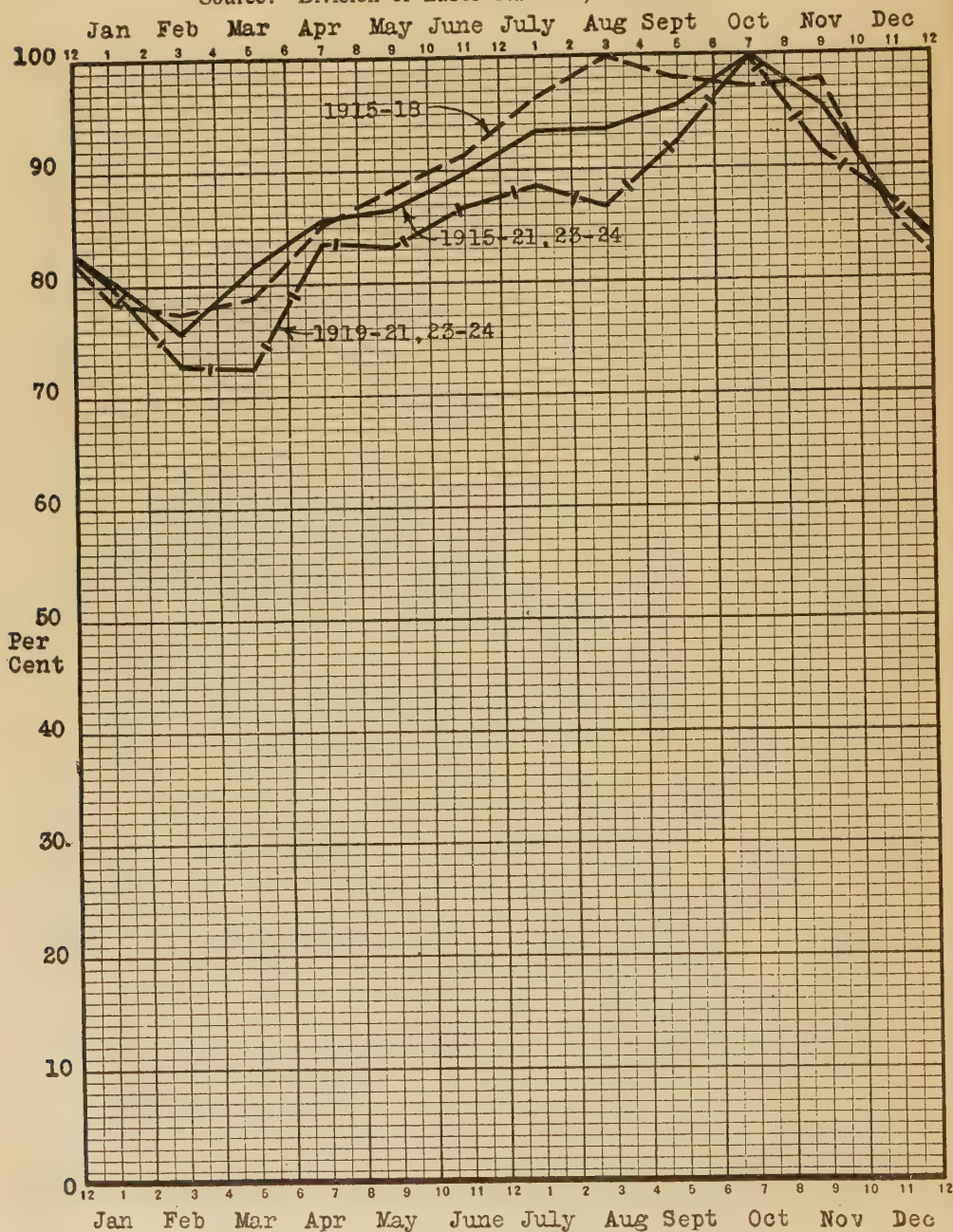


CHART LXXVII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS STREET, ROAD AND SEWER CONTRACTING LUCAS COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

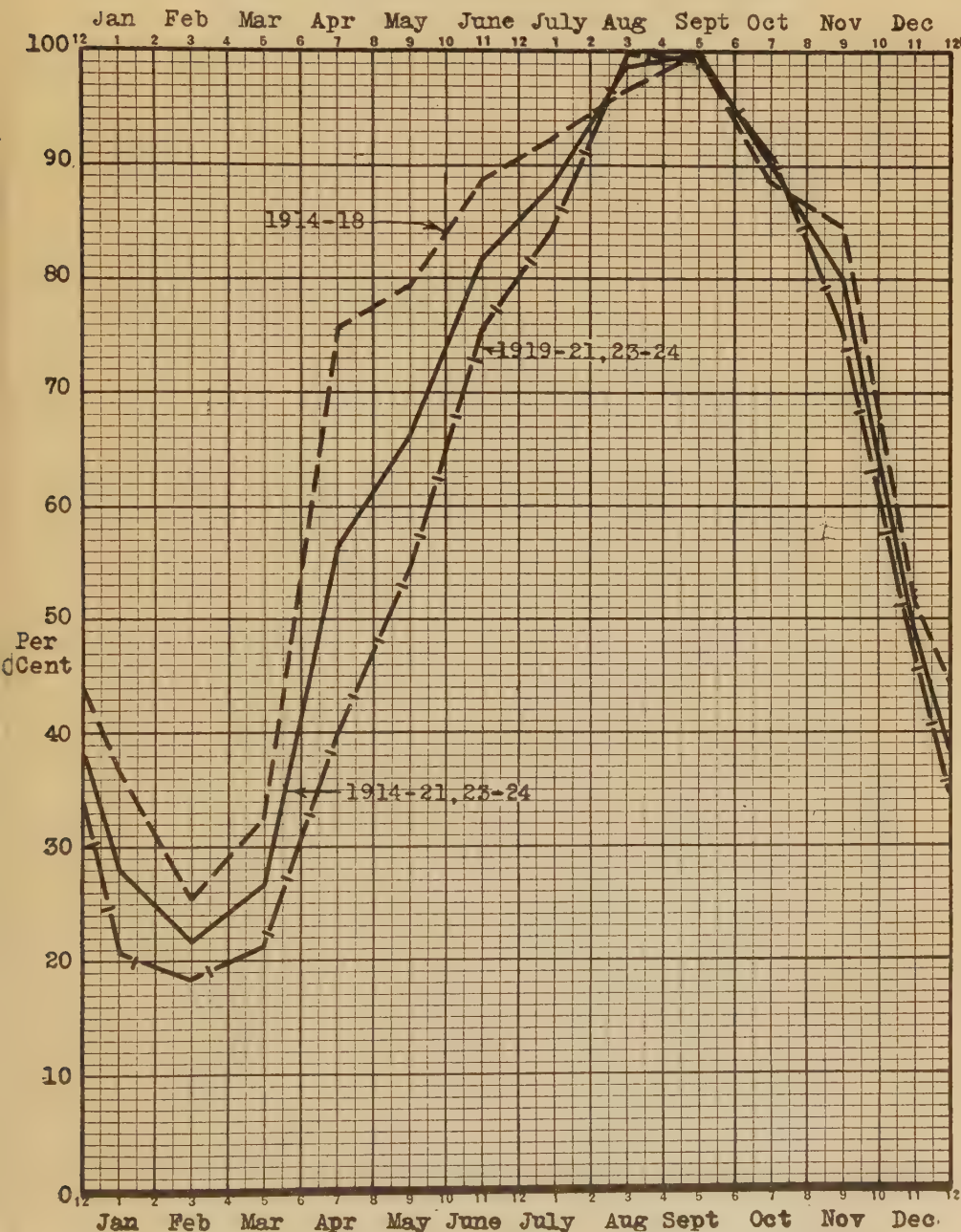


CHART LXXVIII
SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION
MAHONING COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

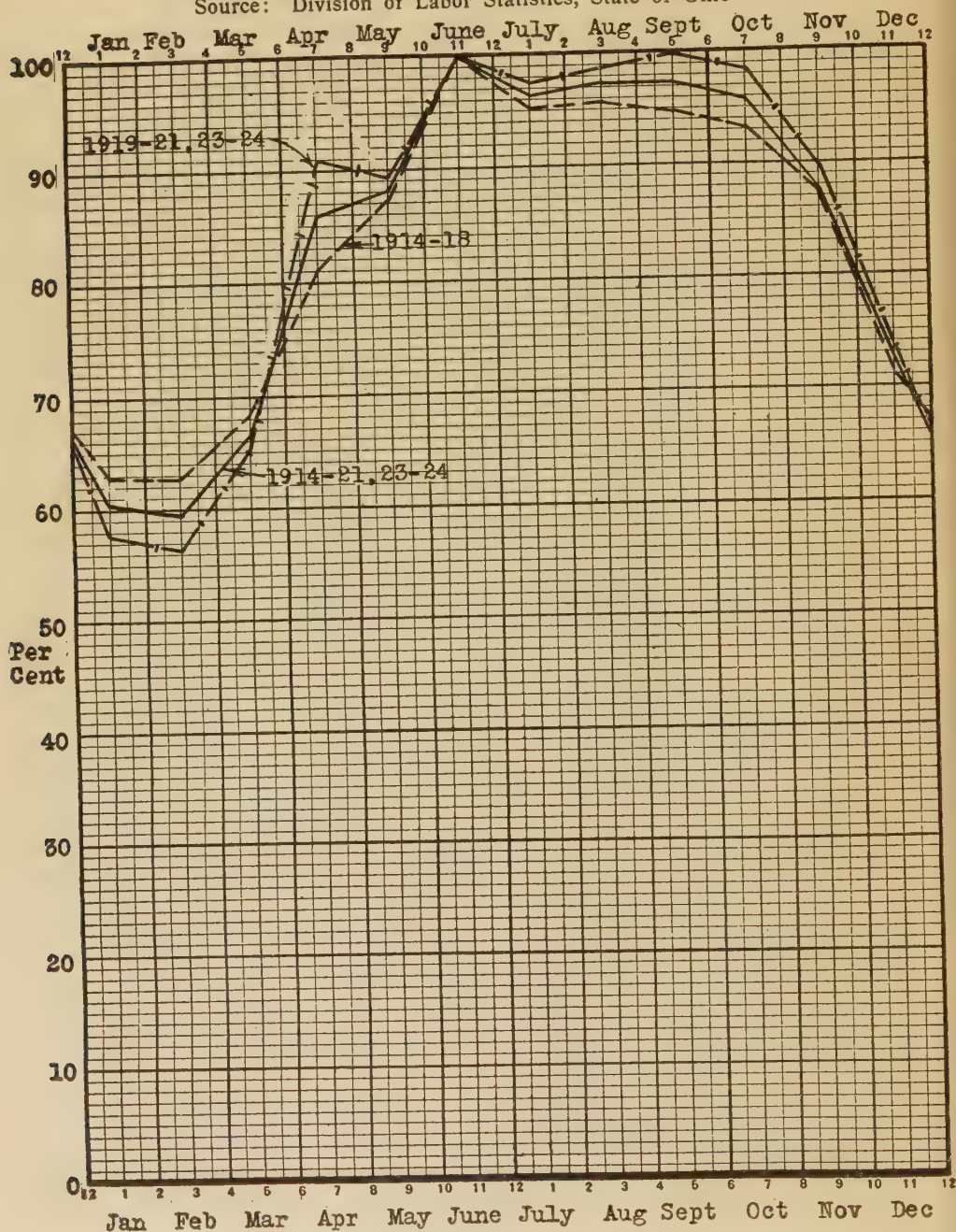


CHART LXXIX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
BRICK, STONE AND CEMENT WORK **MAHONING COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

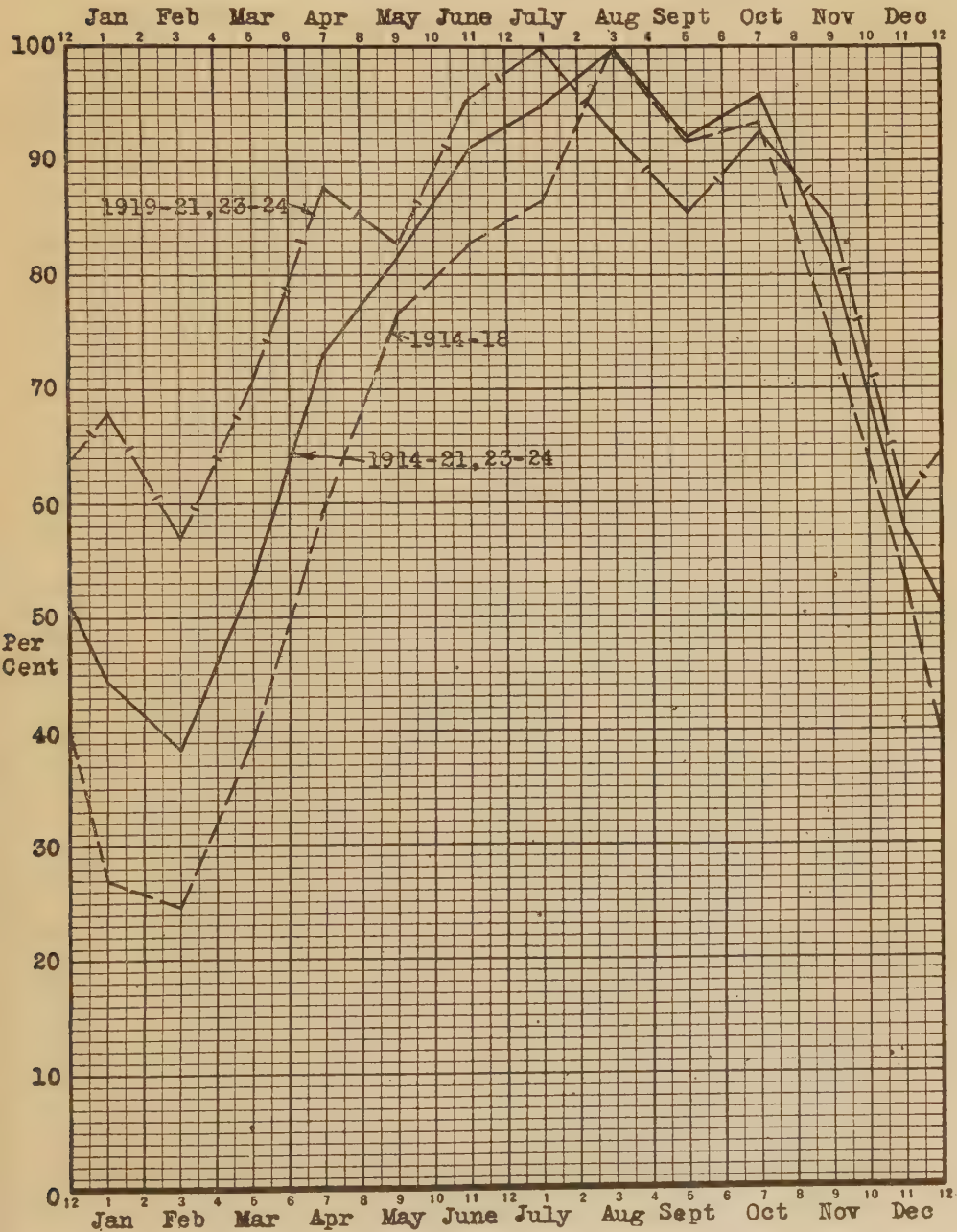


CHART LXXX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ELECTRICAL CONTRACTING **MAHONING COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

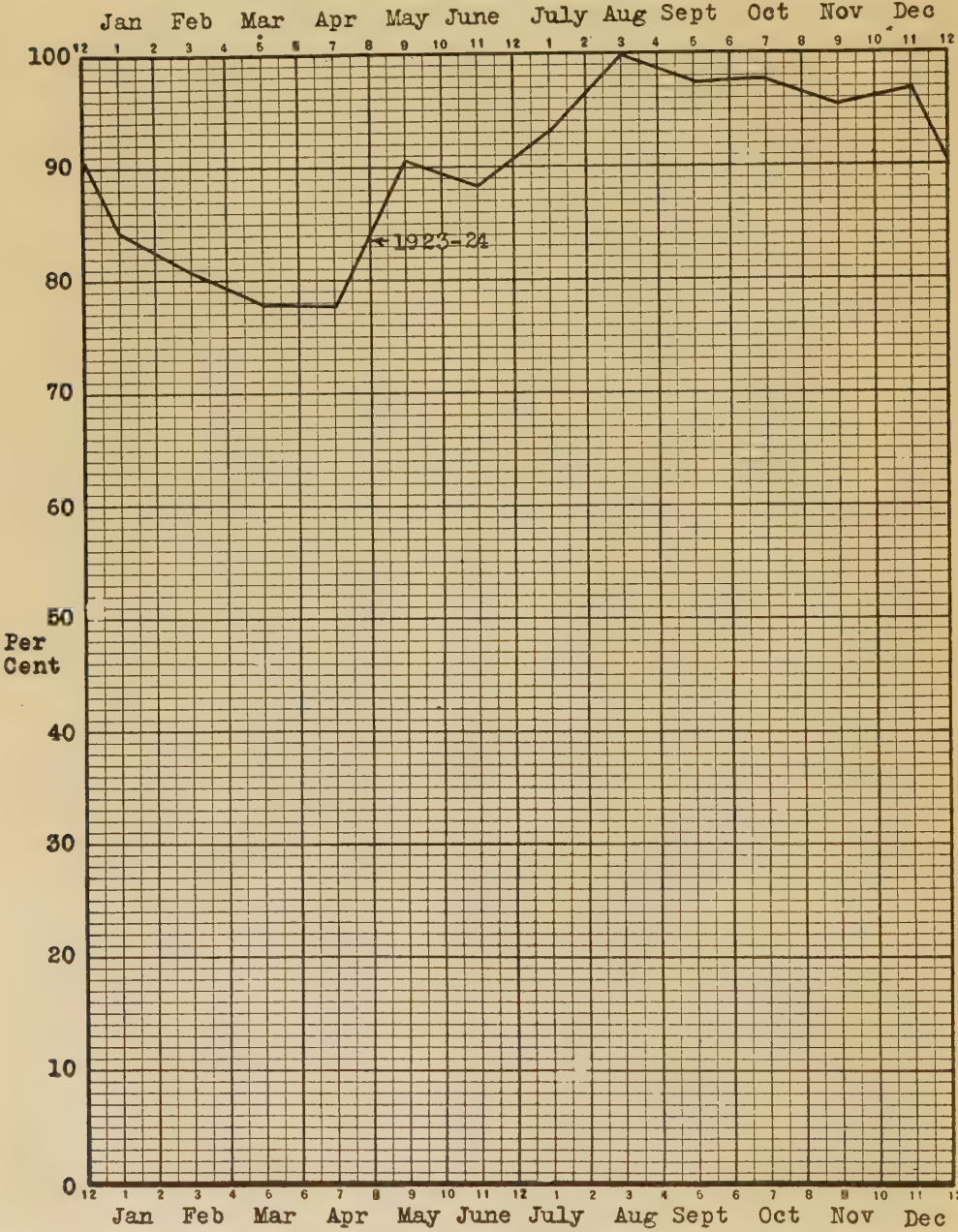


CHART LXXXI

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS

GENERAL CONTRACTING

MAHONING COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

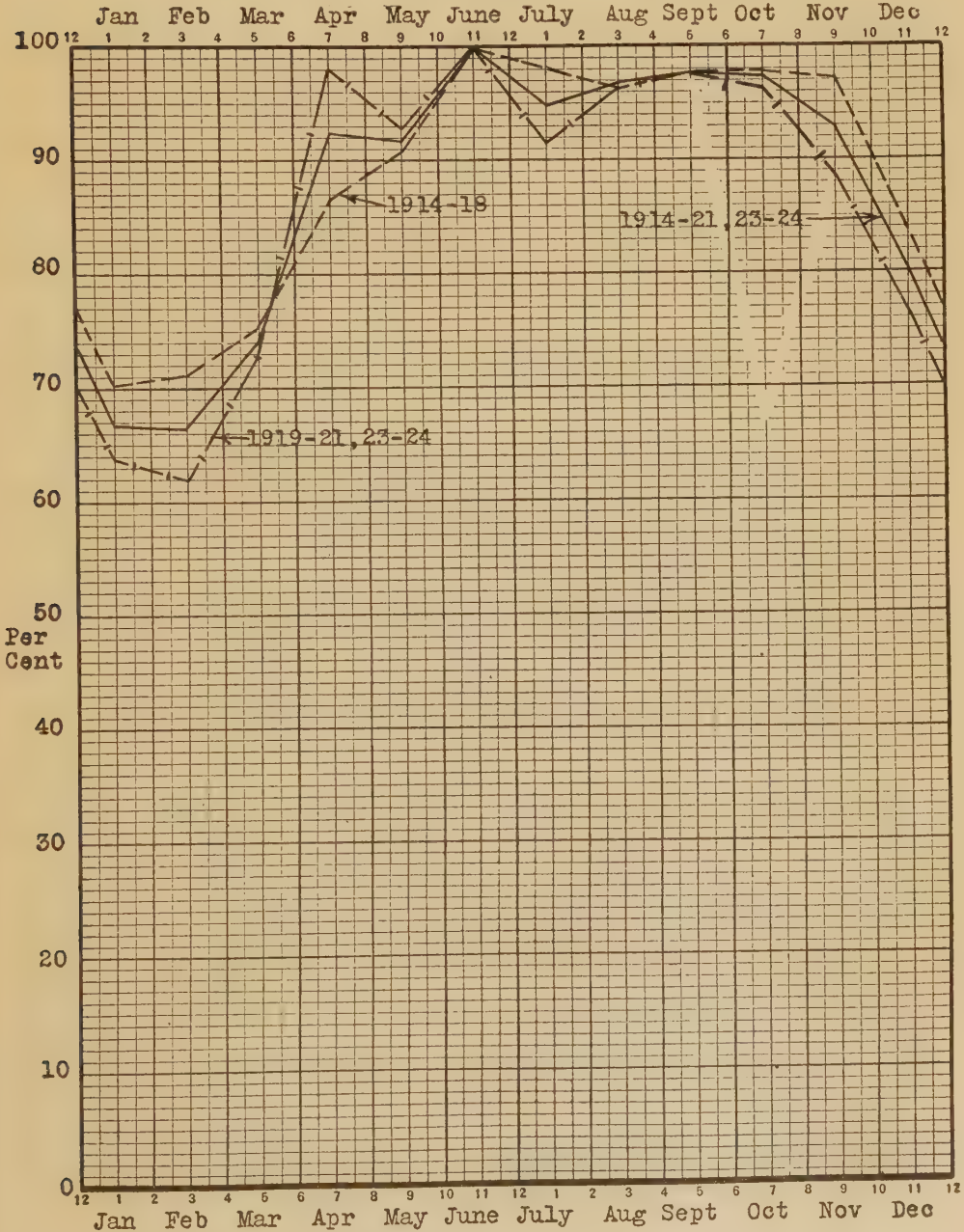


CHART LXXXII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PAINTING AND DECORATING **MAHONING COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

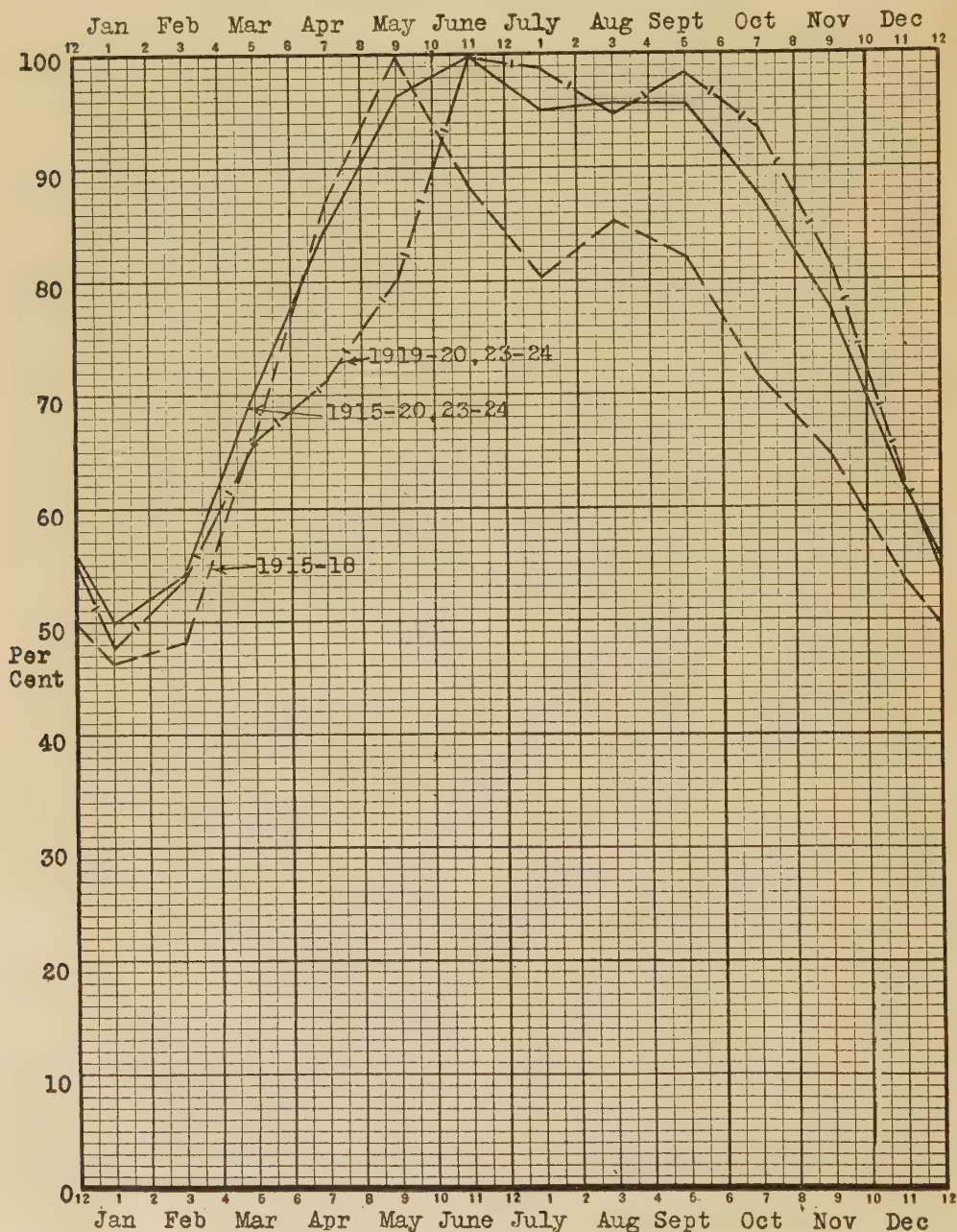


CHART LXXXIII

SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS PLASTERING AND LATHING MAHONING COUNTY, OHIO

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

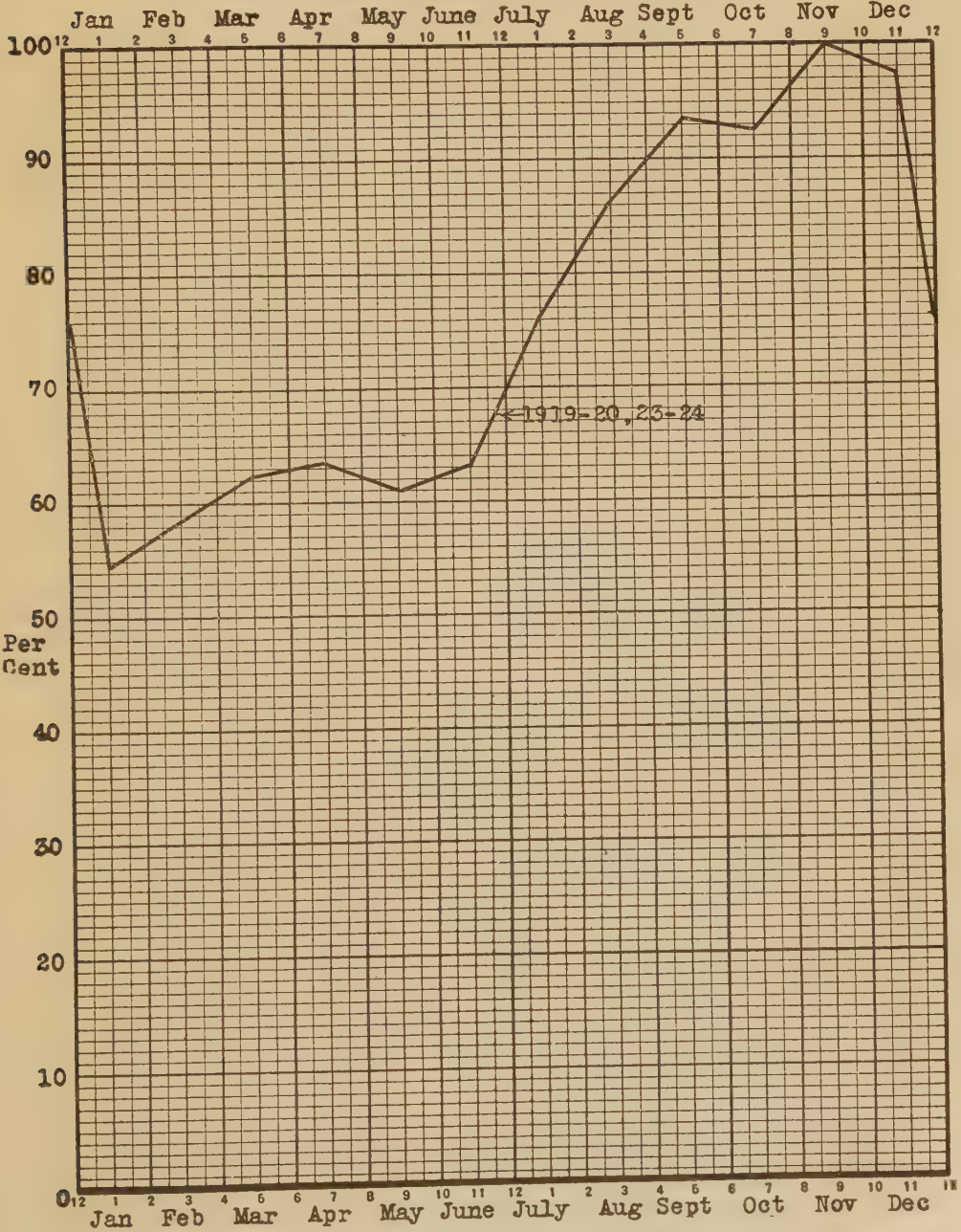


CHART LXXXIV
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 PLUMBING AND STEAM FITTING MAHONING COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

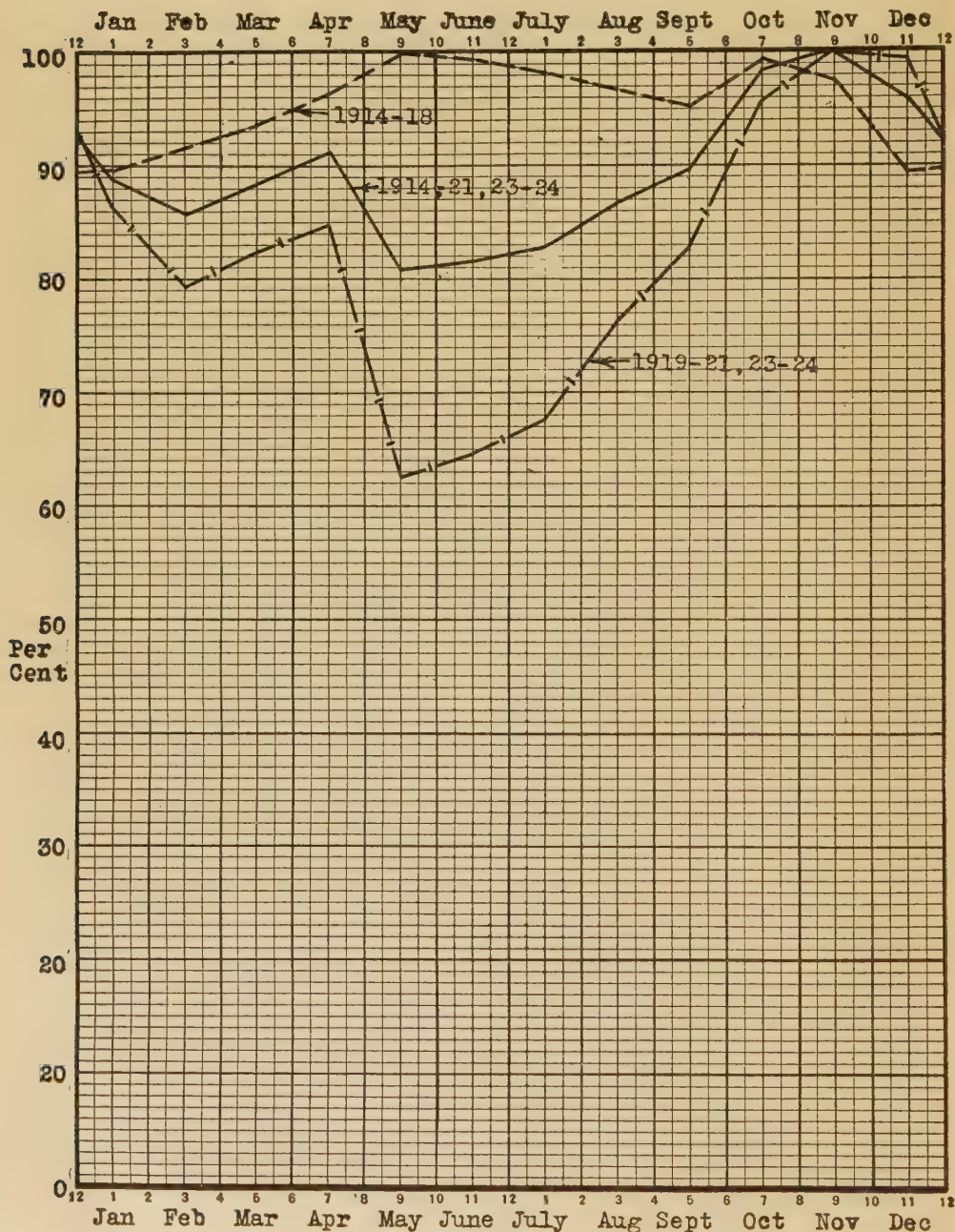


CHART LXXXV
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 ROOFING AND SHEET METAL WORK MAHONING COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

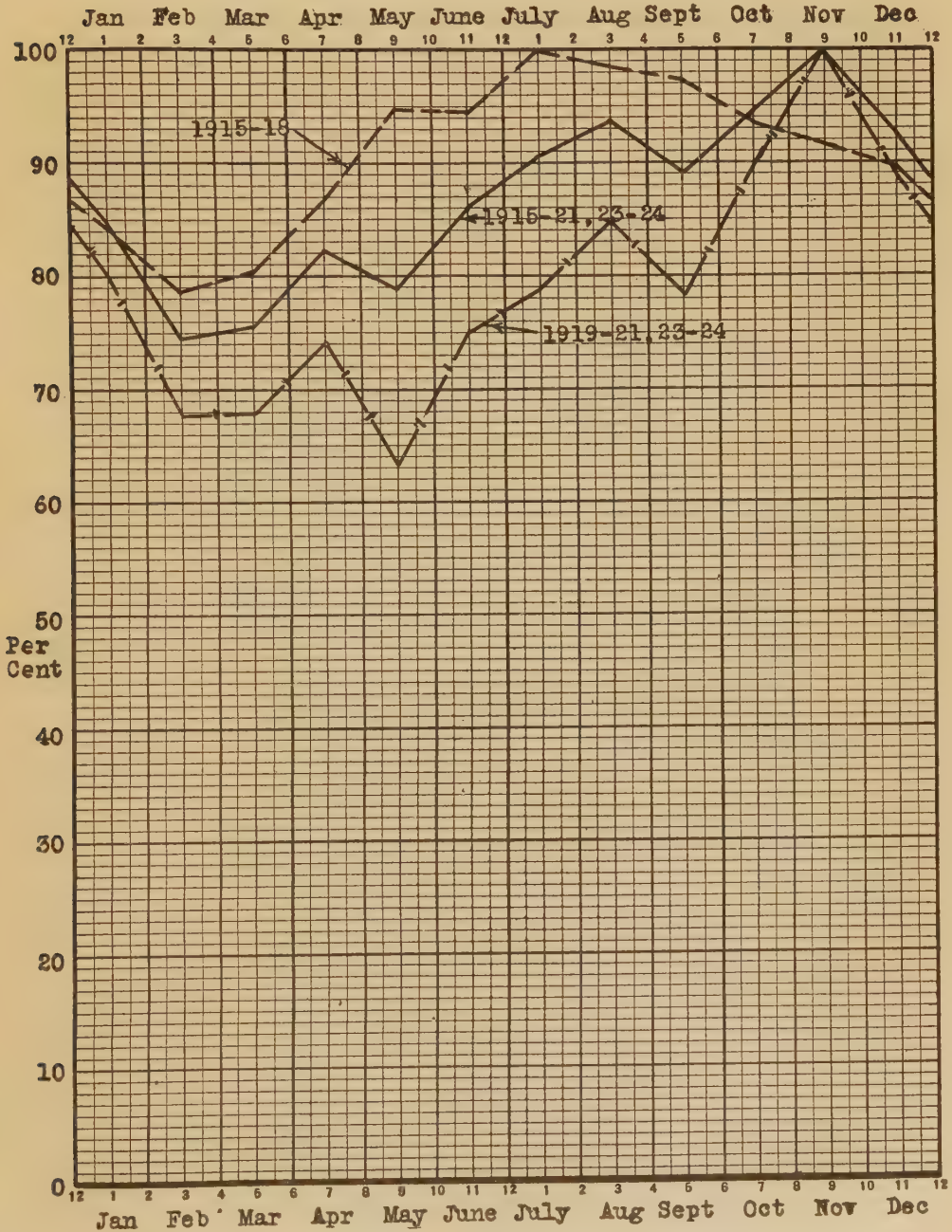


CHART LXXXVI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
STREET, ROAD AND SEWER CONTRACTING MAHONING COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

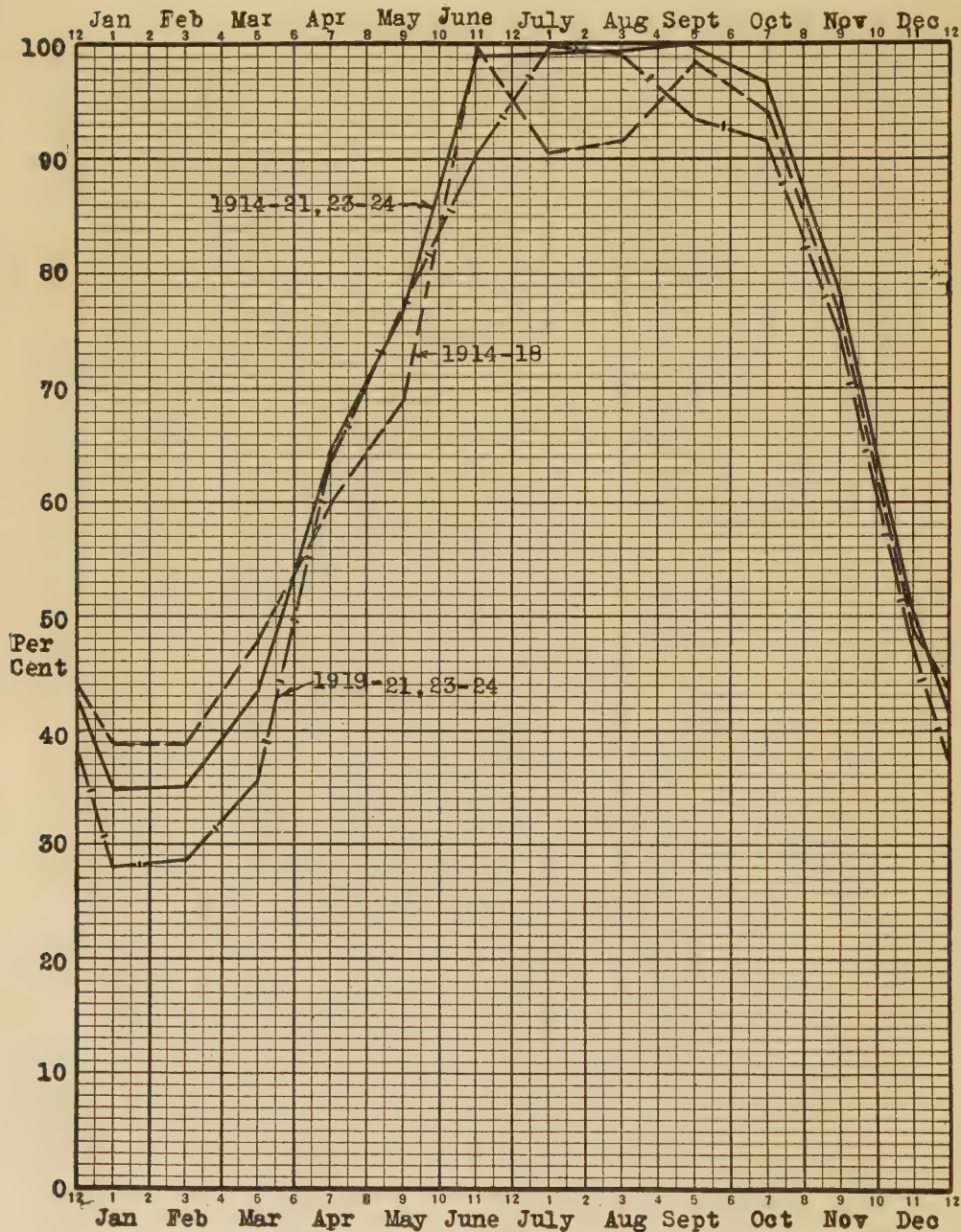


CHART LXXXVII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION **MONTGOMERY COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

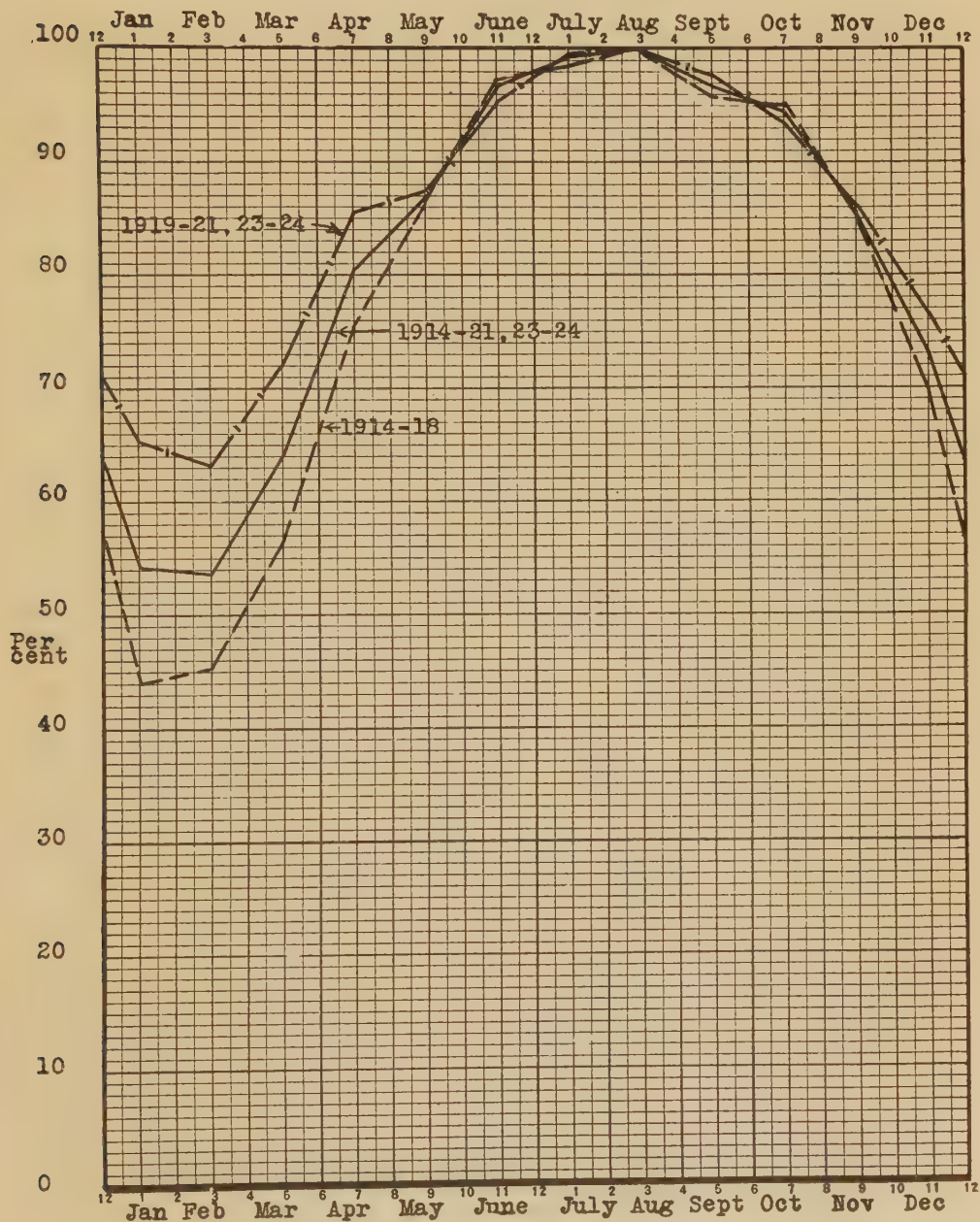


CHART LXXXVIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
BRICK, STONE AND CEMENT WORK **MONTGOMERY COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

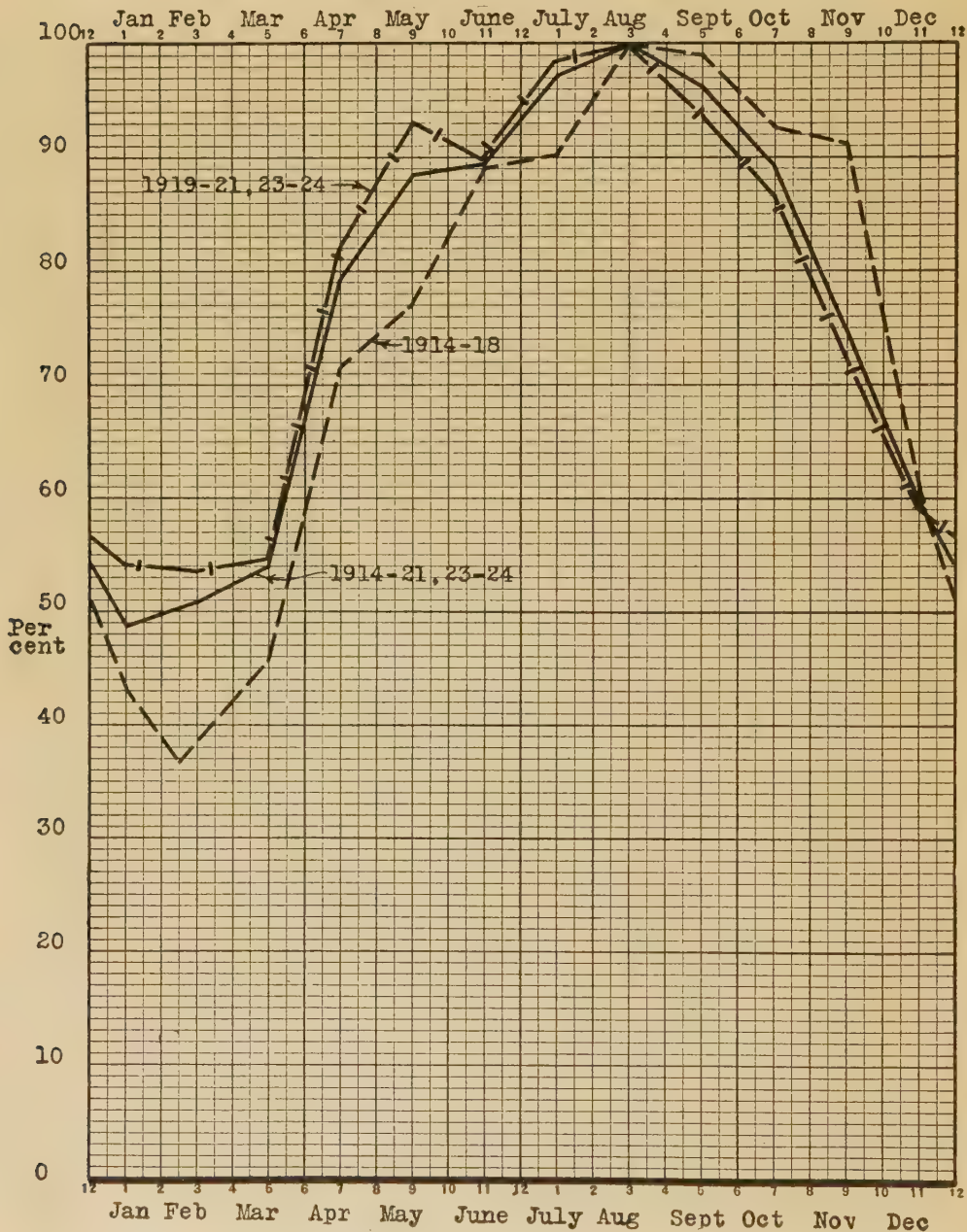


CHART LXXXIX
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
GENERAL CONTRACTING MONTGOMERY COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

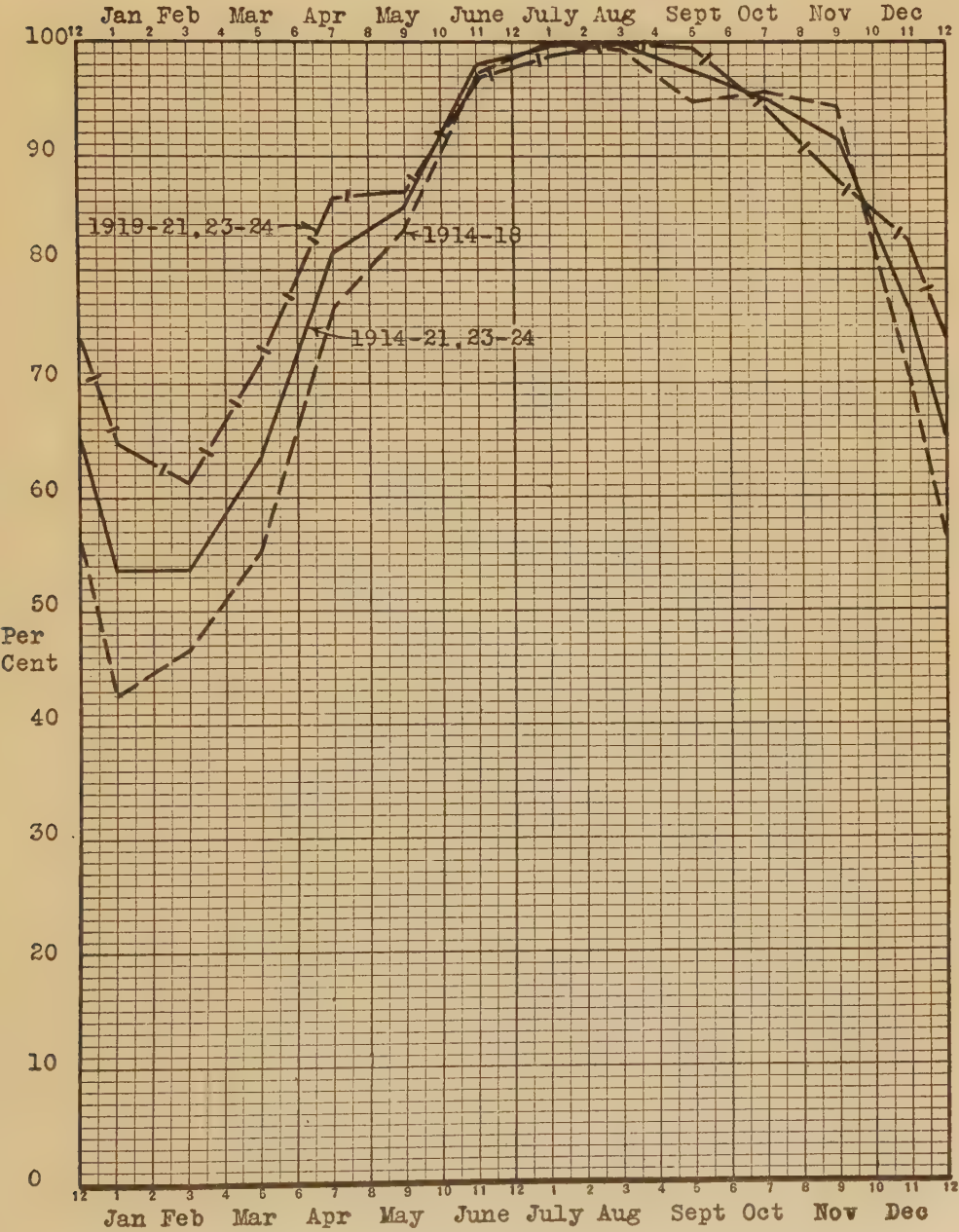


CHART XC
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PAINTING AND DECORATING **MONTGOMERY COUNTY, OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

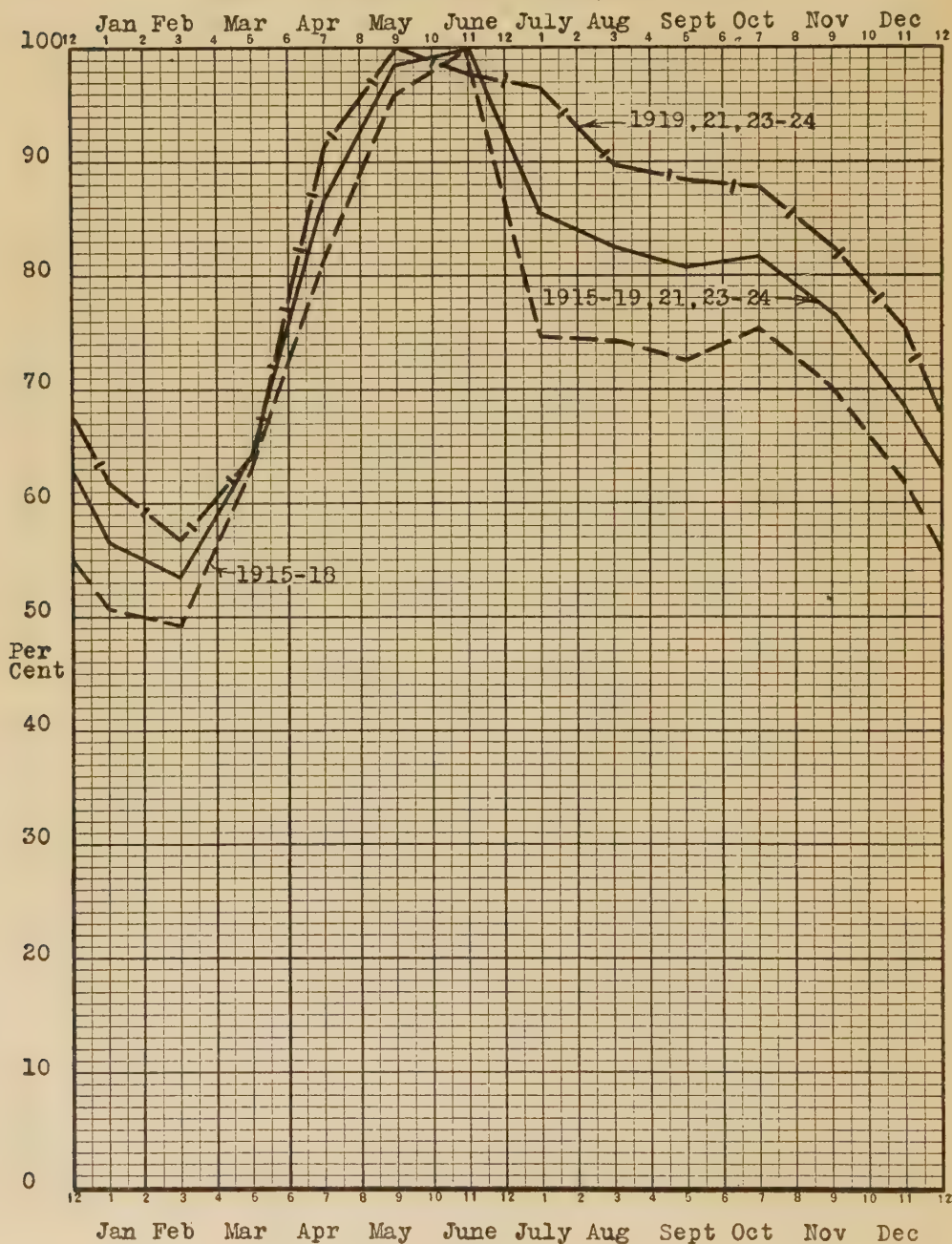


CHART XCI
 SEASONAL FLUCTUATIONS IN EMPLOYMENT OF WAGE EARNERS
 PLUMBING AND STEAM FITTING
 MONTGOMERY COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

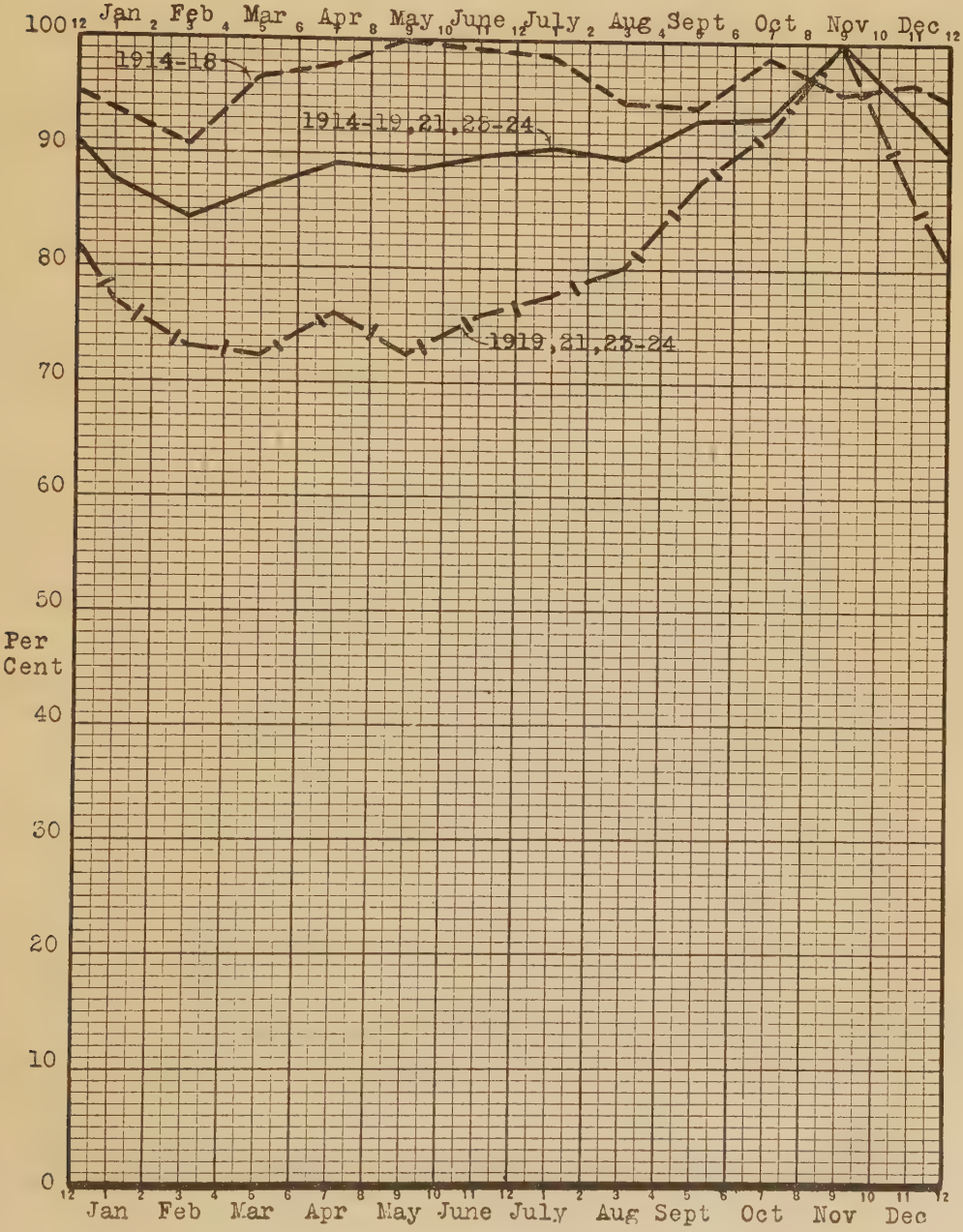


CHART XCII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
SHEET METAL WORK AND ROOFING **MONTGOMERY COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

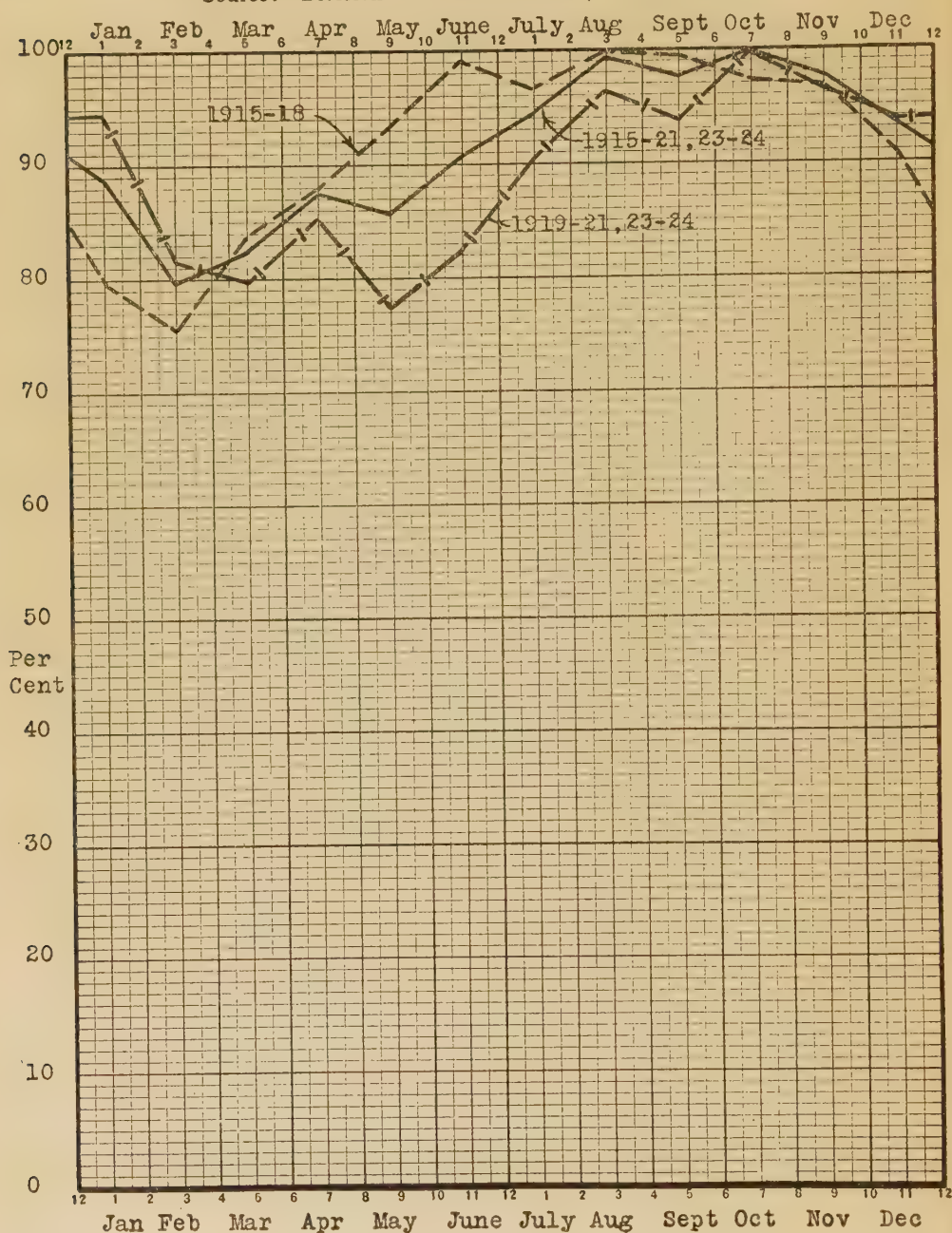


CHART XCIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
STREET, ROAD AND SEWER CONTRACTING MONTGOMERY COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

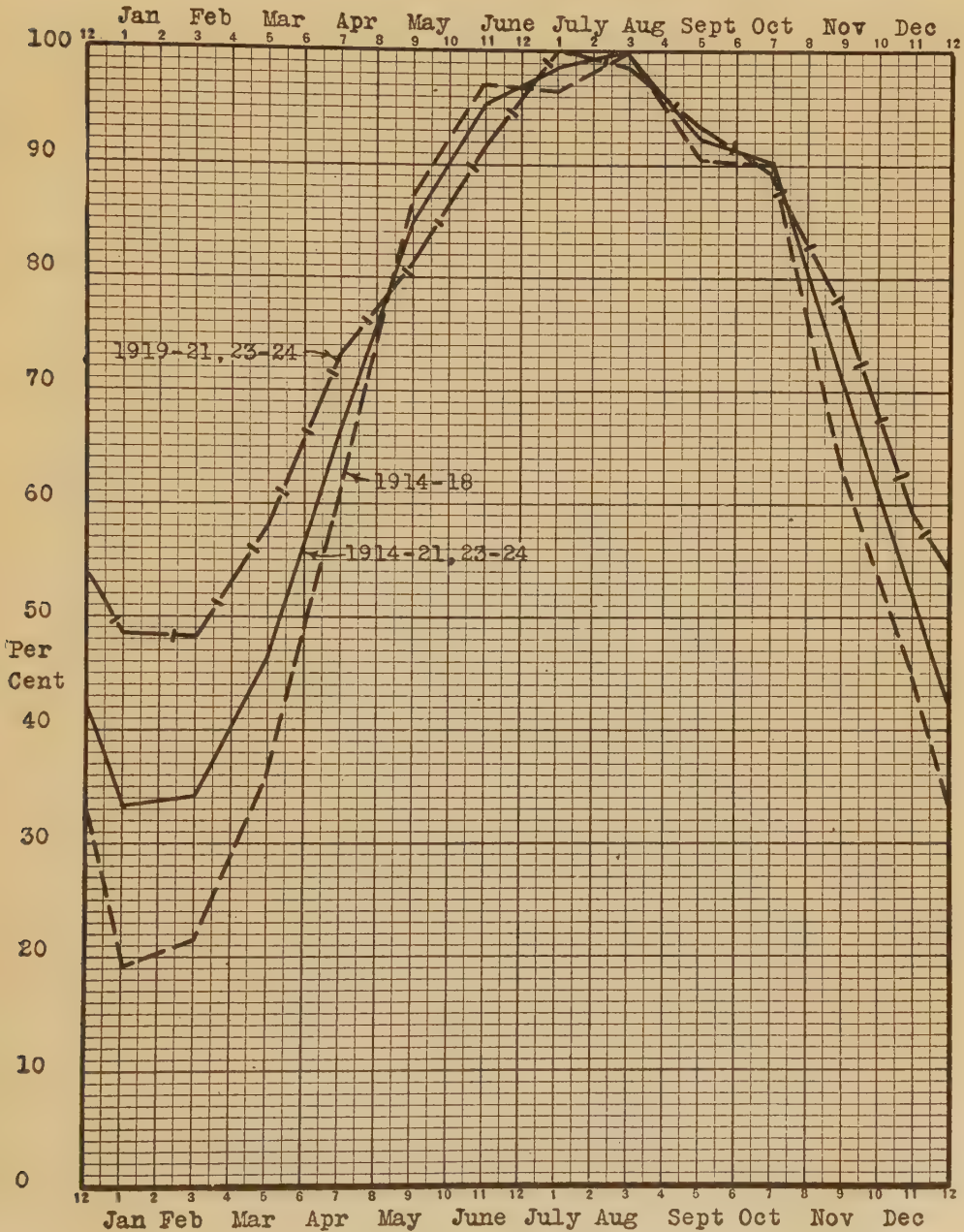


CHART XCIV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
ALL CONSTRUCTION **SUMMIT COUNTY, OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

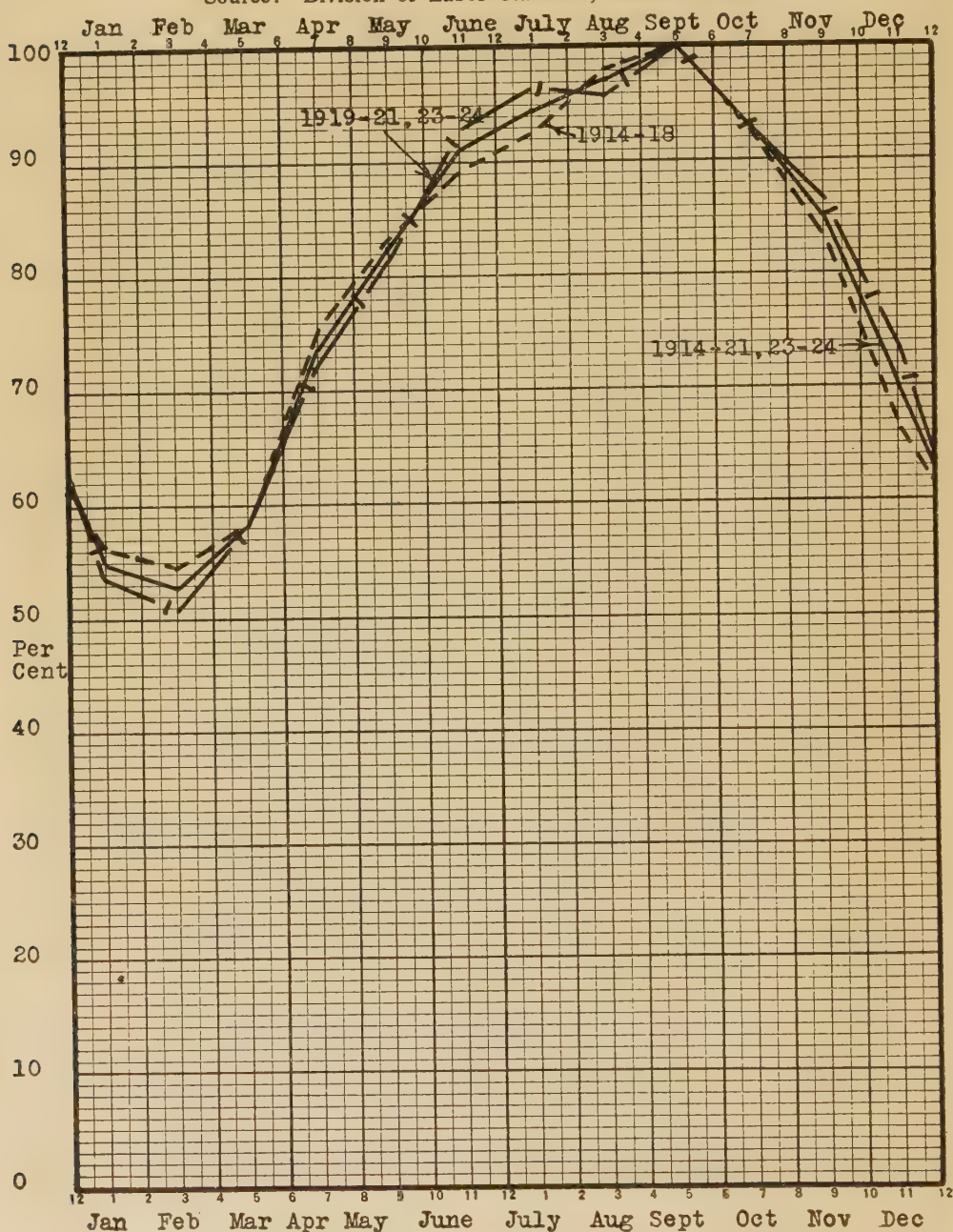


CHART XCV
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
BRICK, STONE AND CEMENT WORK
SUMMIT COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

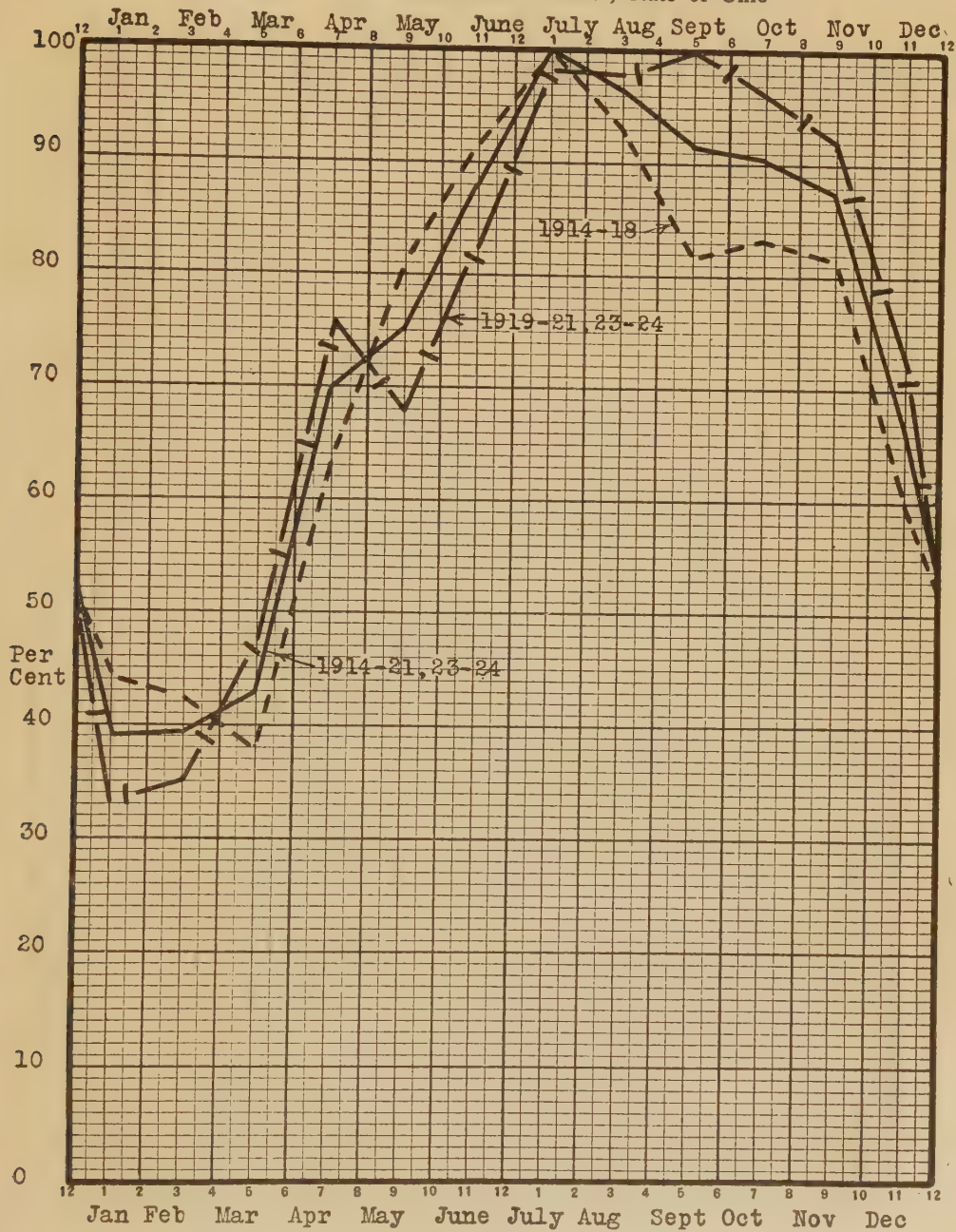


CHART XCVI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
GENERAL CONTRACTING **SUMMIT COUNTY, OHIO**

Month of Greatest Employment in Each Series Equals 100

Source: Division of Labor Statistics, State of Ohio

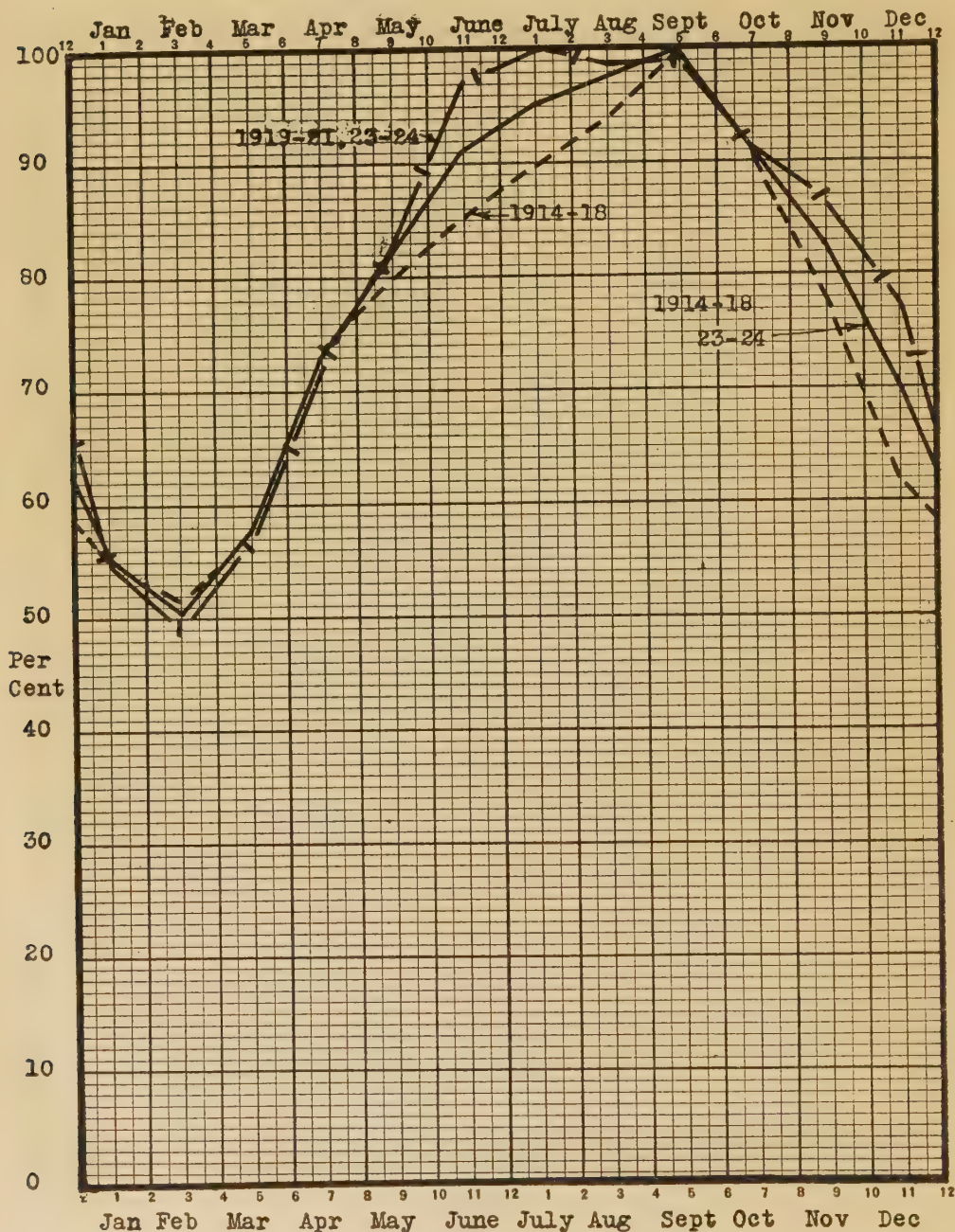


CHART XCVII
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 PAINTING AND DECORATING
 SUMMIT COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

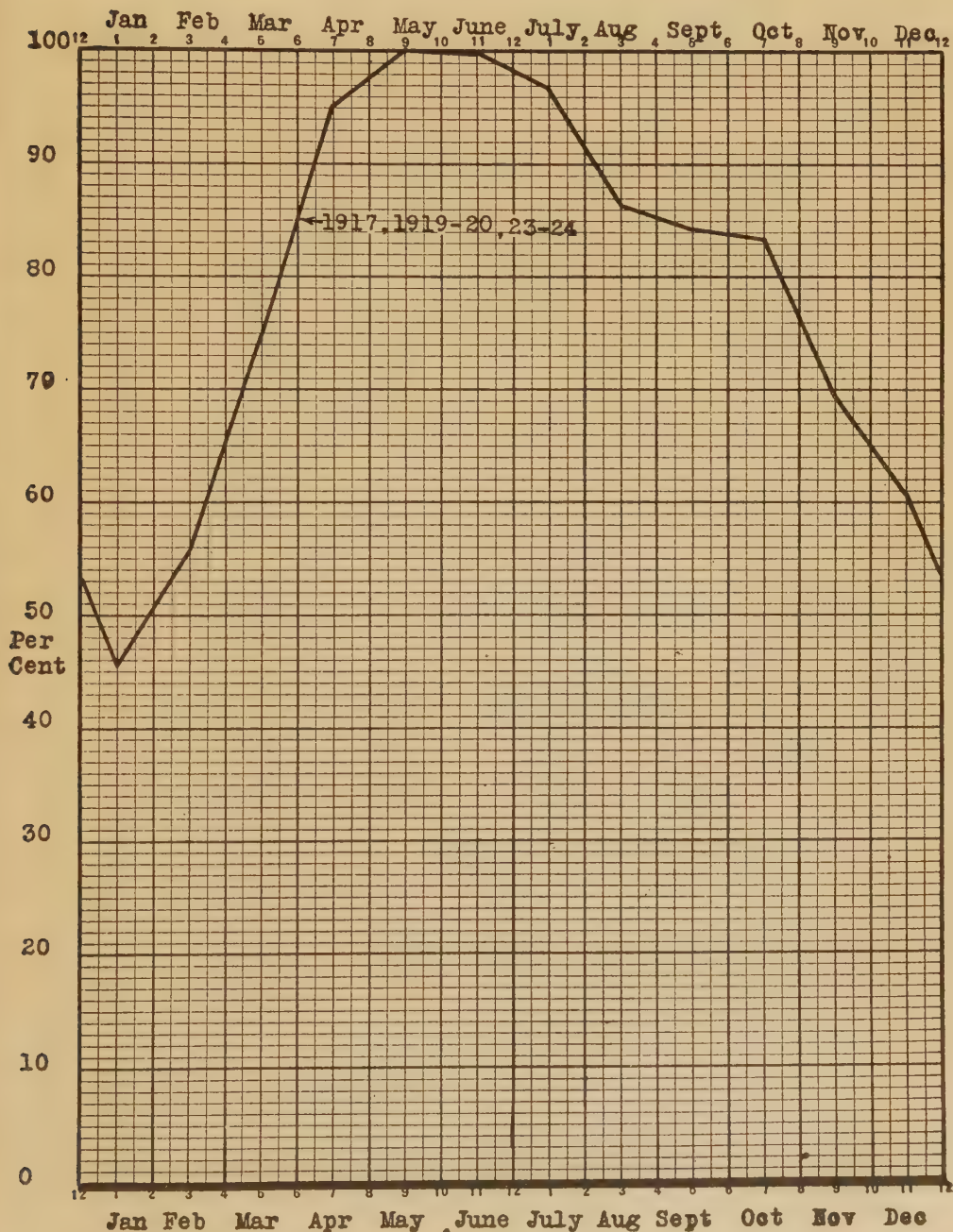


CHART XCVIII
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
PLASTERING AND LATHING **SUMMIT COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

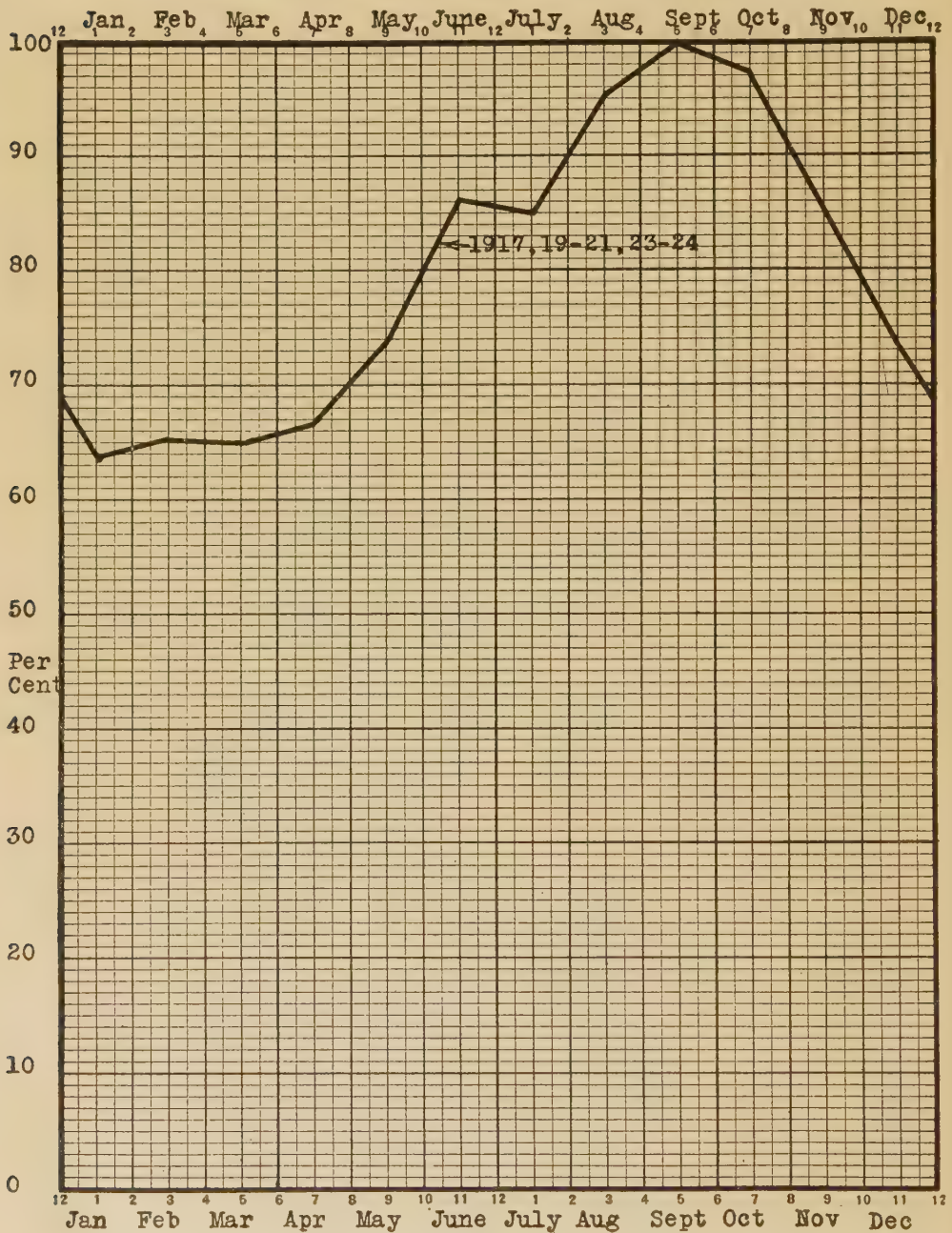


CHART XCIX
 SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
 PLUMBING AND STEAM FITTING
 SUMMIT COUNTY, OHIO
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

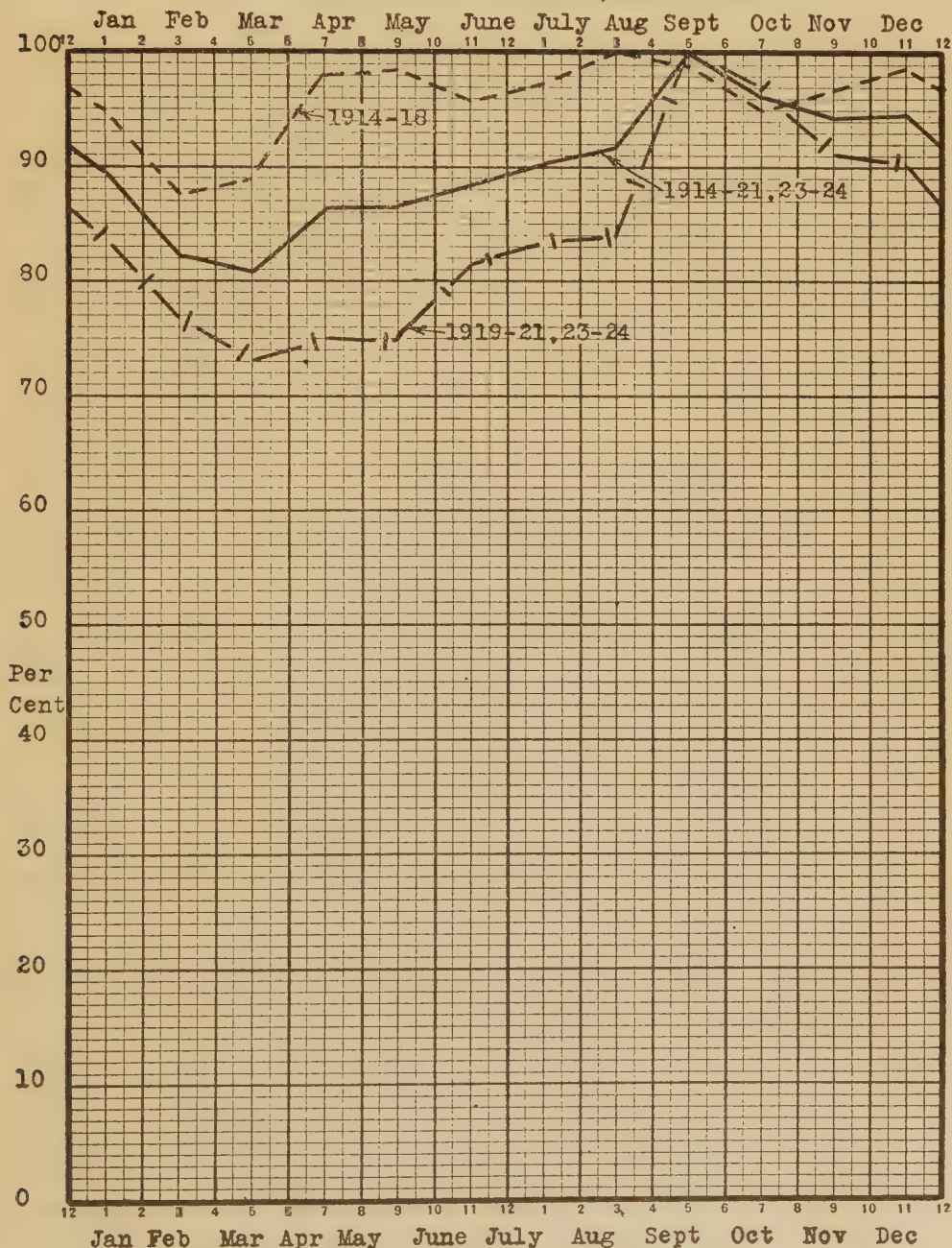


CHART C
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
SHEET METAL WORK AND ROOFING **SUMMIT COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio

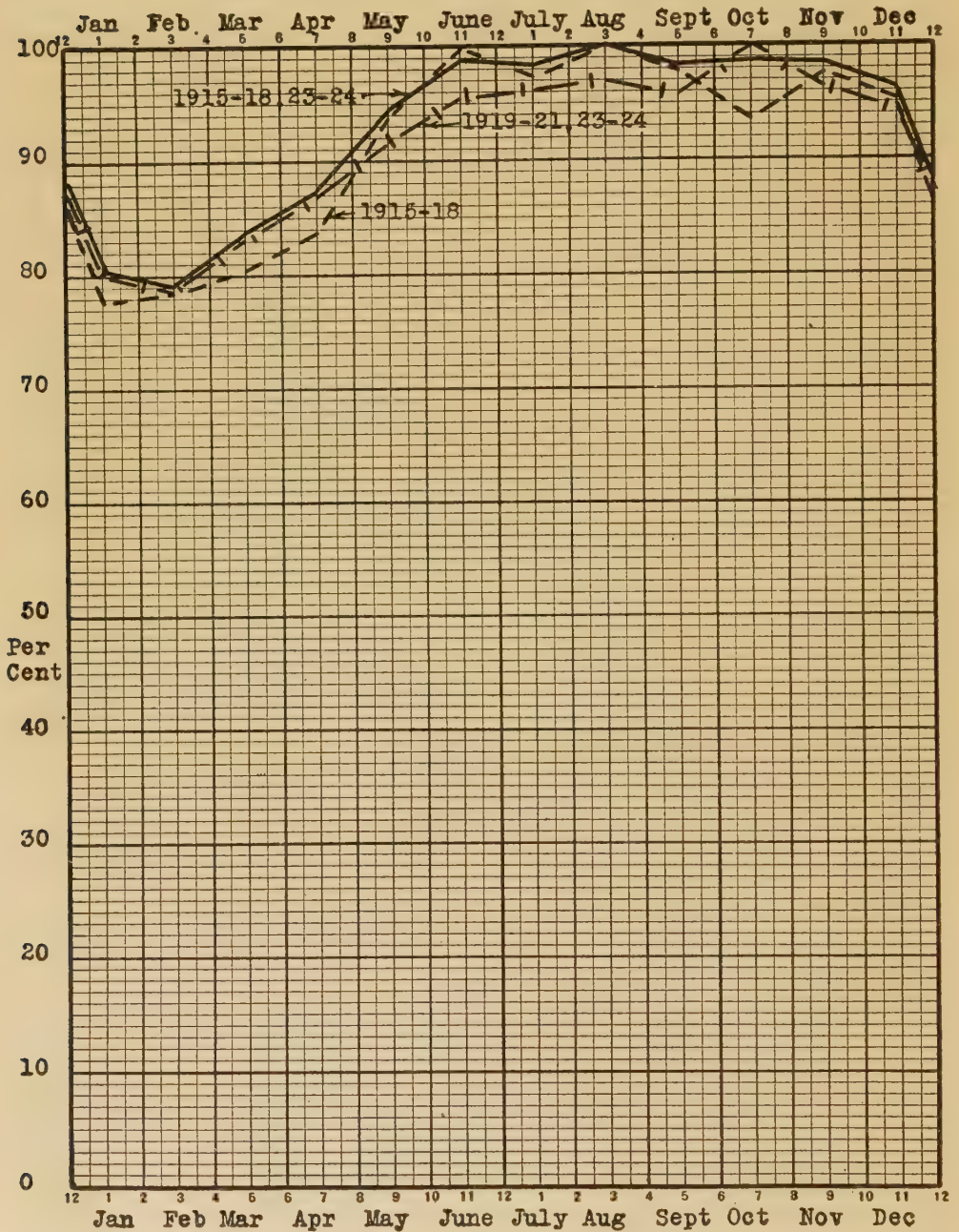
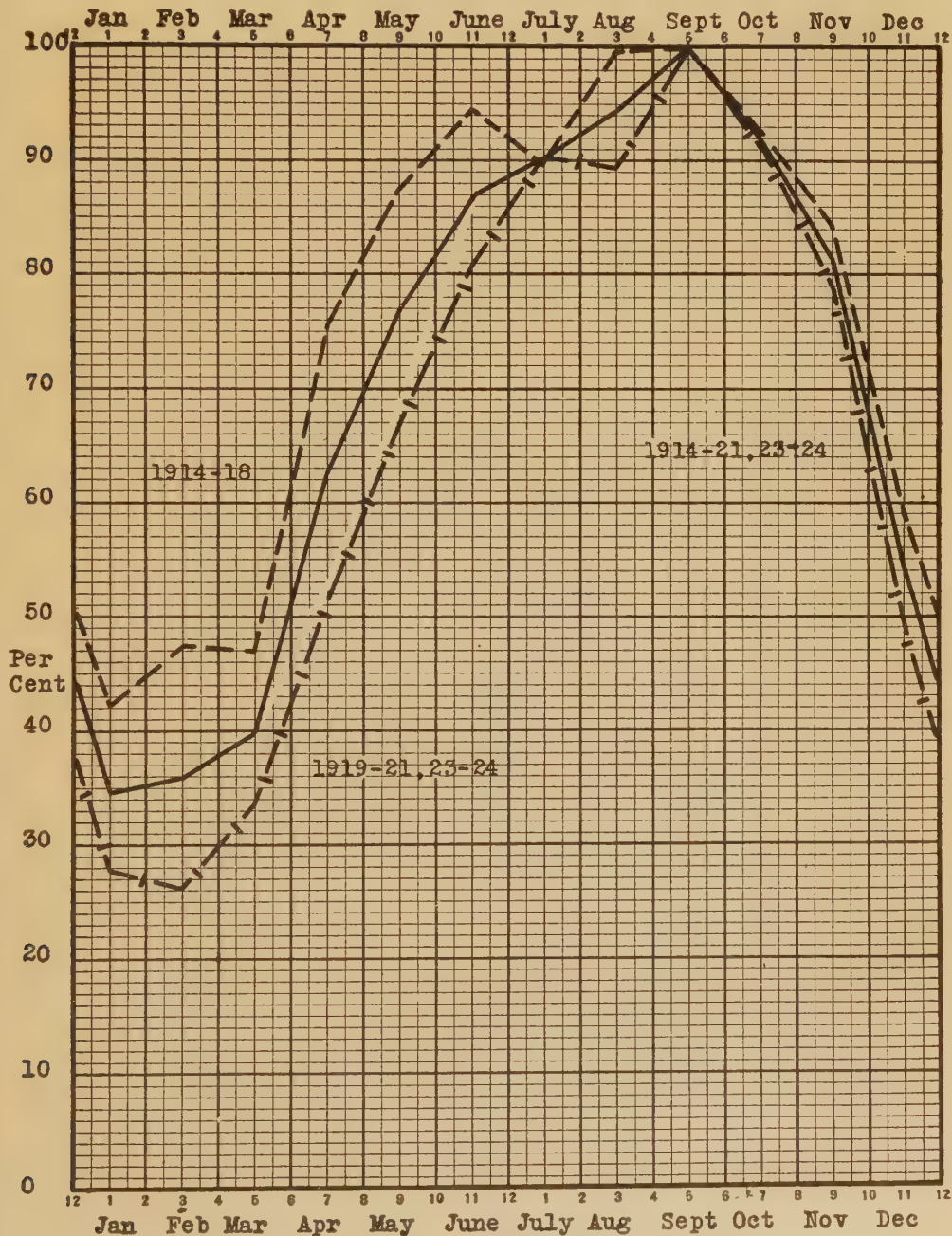


CHART CI
SEASONAL FLUCTUATION IN EMPLOYMENT OF WAGE EARNERS
STREET, ROAD AND SEWER CONTRACTING **SUMMIT COUNTY, OHIO**
 Month of Greatest Employment in Each Series Equals 100
 Source: Division of Labor Statistics, State of Ohio



CHAPTER V

THE REMEDY FOR SEASONAL EMPLOYMENT IN THE OHIO CONSTRUCTION INDUSTRY

The Feasibility of Winter Construction

Technical Changes in the Art of Construction

Highly fluctuating activity in the building industry has, until recent years, been considered a necessary economic evil in view of the exposed character of much of building operations. However, within the last few years it has been amply demonstrated that the weather factor can be coped with and that fairly continuous building operations are possible in almost all parts of the United States. "Custom, not climate, is mainly responsible for seasonal idleness in the construction industries," is the report of the Committee of the President's Conference on Unemployment, referred to in an earlier section.

Significant changes have taken place in the technique of construction within recent years. Manual labor has been supplanted to a considerable extent by machine processes, which processes can be carried on in colder weather. Machine excavation is a case in point. In the case of structural steel construction, much of the work is actually done at the steel mill, the fabricated parts being delivered on the job. New types of cement have been introduced, types which set in a relatively short time. It has been found that concrete mixtures may be heated and that forms may be heated after the concrete has been poured.

With regard to the human factor, progressive builders are able to provide protection which insures safe and efficient work. On most projects this protection is supplied by canvas coverings and by artificial heating. Structural steel and reinforced concrete projects are especially adapted to this type of protection, since the supporting frame and floors are erected relatively soon after the project is commenced.

The Experiences of Winter Construction

The building history of the last six or seven years provides abundant evidence of the practicability of winter construction. A large volume of winter building has been carried on in most of the larger cities of the country. The experiences of construction firms engaged in this work have been reported in the daily press, trade

journals, and in the report of the Committee of the President's Conference on Unemployment. The summary of the advantages and disadvantages of winter construction as given in "Seasonal Operation in the Construction Industries," page 105, are appropriate at this point.

Advantages of Winter Construction

"1. Savings in labor cost through greater productivity of some 21½ per cent of total cost.

2. Cream of labor obtainable through the employment of the men in the various trades at a time when the supply exceeds demand.

3. Reduction in amount of poor work by incompetent men.

4. Labor more anxious to hold jobs in times of unemployment, and hence more efficient.

5. Seasonal price fluctuation in material prices, by which most materials can be bought cheaper when needed for winter use.

6. Contractors willing to figure on closer margin to get business.

7. Three to six months' time often saved in interest on capital tied up.

8. Less freight congestion, resulting usually in better material deliveries.

9. No lassitude in workmen due to extreme heat of summer.'

Disadvantages of Winter Construction

"1. Extra cost of winter protection 1 to 5 per cent of total cost.

2. Fewer possible working days, due to necessity of clearing away snow, or to extreme cold weather, thus tying up capital for longer period. This does not apply to buildings requiring a year or more to erect.

3. More difficult working conditions for some trades.

4. Occasional snow storms that temporarily tie up traffic."

It will always be true that winter work will involve some additional costs as a result of the required protection of men and materials. As indicated above, these costs will usually range from one to five per cent of the total cost of the project. This, however, states only part of the case. As shown above, there are advantages which offset these additional costs.

The Available Labor Supply in the Ohio Construction Industry by Months

The Seasonal Oversupply

It has been shown in the preceding section that employment in the different groups of the construction industry in Ohio is not regular, but is characterized by a pronounced peak in the warm months and by an equally pronounced trough in the cold months. This means that regularly during certain months of the year there is a large oversupply of labor in the building trades. During the remainder of the year, observation shows that there is such an increase in activity that there is often an undersupply of labor in these same building trades. During one season employers are resorting to all sorts of practices to secure more artisans and laborers; during the next season workers are walking the streets in search of employment. Since it has been shown that winter construction is entirely feasible, this situation can only be described as a reflection on management practices in the construction industry. Much improvement can be made by the planning of structures to take advantage of the seasons of slack employment. Chart CII is introduced at this point. This is a planning chart which shows the average percentages of employment by months in the different groups of the construction industry.¹ The shaded areas show the average percentage of employment, and the white areas the average percentage of unemployment, the peak month in each group being indicated by double cross-hatching. The groups of the industry are shown from left to right in the normal sequence of their operations. The sections labeled "second year" and "third year" are repetitions of the section labeled "first year," since a particular project commenced in one year may be projected into the third year before completion. Obviously the management problem here is to plan operations on a particular project so as take advantage of the seasons of unemployment. It is, of course, recognized that all operations cannot be so planned. The chart merely shows the best period for building from the standpoint of one factor, i. e.,

¹The Chart is based on the averages for the eleven year period, 1914-1924 for the various groups of the industry. The first column, labelled "Common Labor," is based on the combined data of the Sand and Gravel Excavating and the Street, Road, and Sewer Contracting groups. The fourth column, labelled "Carpentry," is based on the General Contracting group. This procedure has been suggested by practical builders, they indicating that their employment of carpenters fluctuates closely with their employment of all trades.

CHART CII
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, STATE OF OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF LABOR STATISTICS, STATE OF OHIO

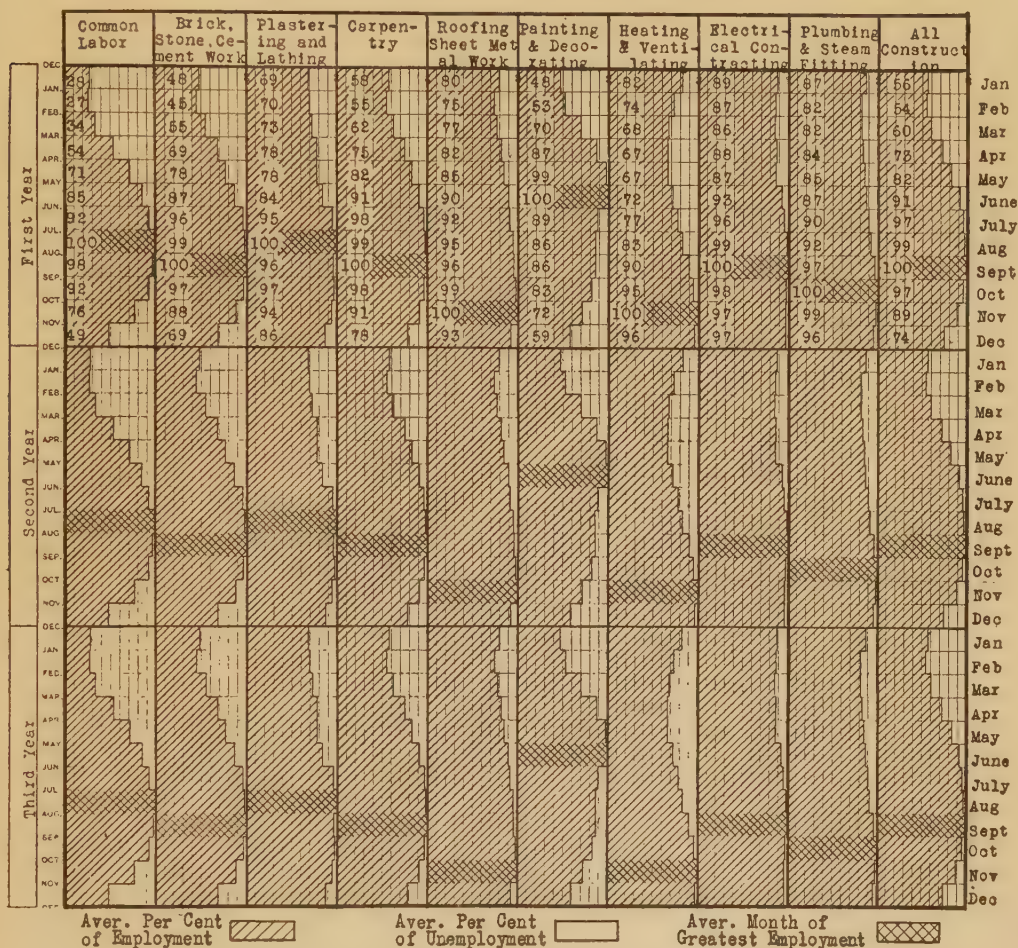


CHART CIII
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUS-
TRY BY GROUPS, CUYAHOGA COUNTY, OHIO, SHOWING CONTINUOUS
MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF
LABOR STATISTICS, STATE OF OHIO

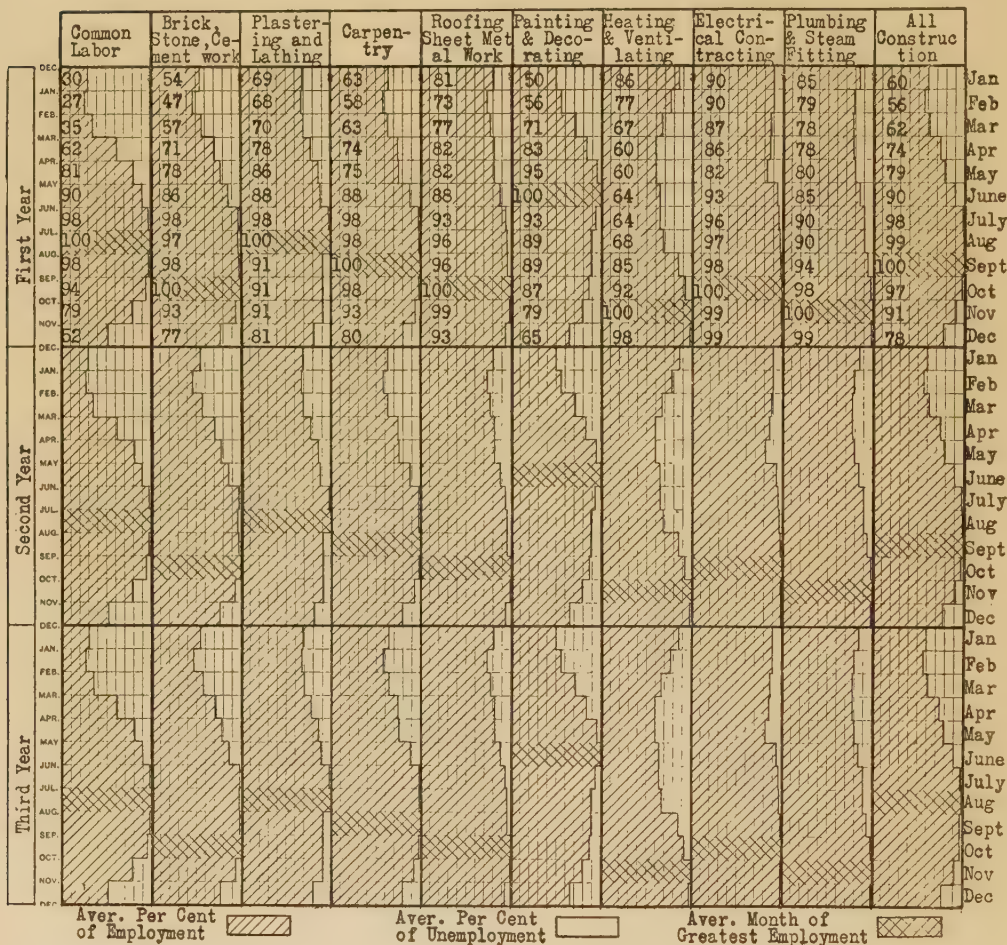
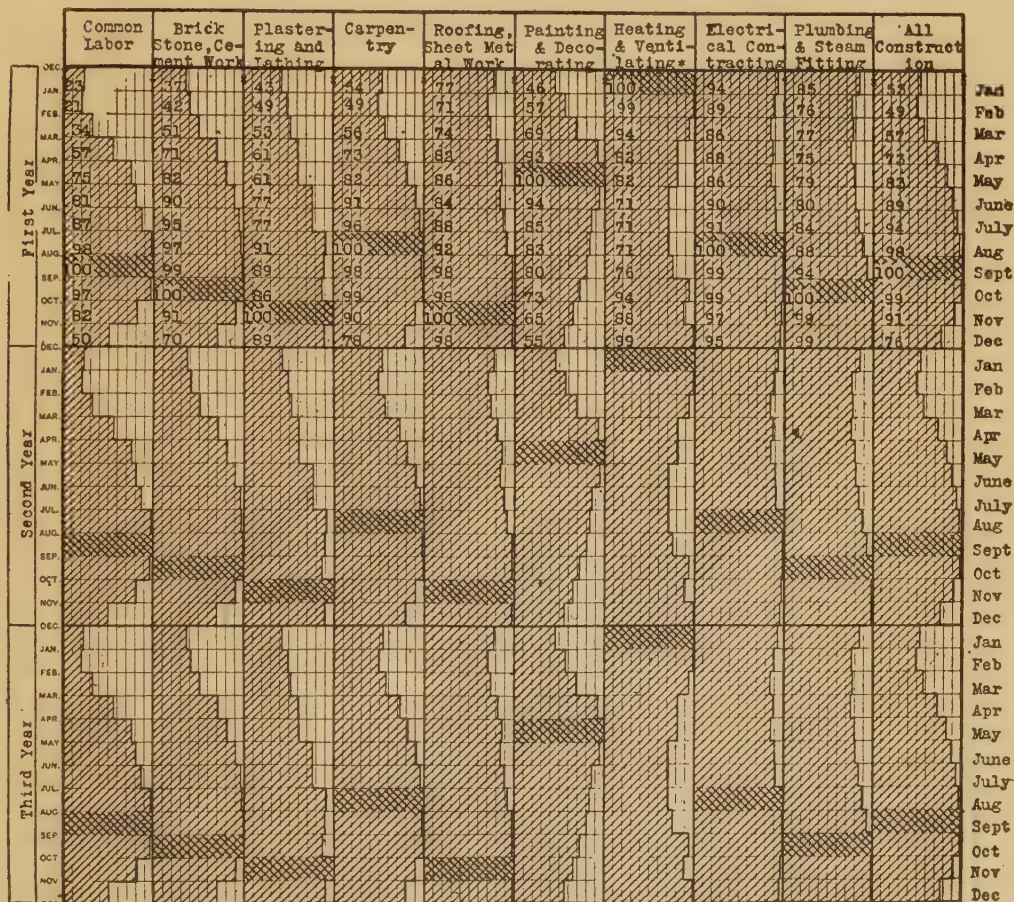


CHART CIV
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, FRANKLIN COUNTY, OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF LABOR STATISTICS, STATE OF OHIO



Aver. Per Cent of Employment *1924 Figures Only

Aver. Per Cent of Unemployment

Aver. Month of Greatest Employment

CHART CV
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, HAMILTON COUNTY, OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF LABOR STATISTICS, STATE OF OHIO

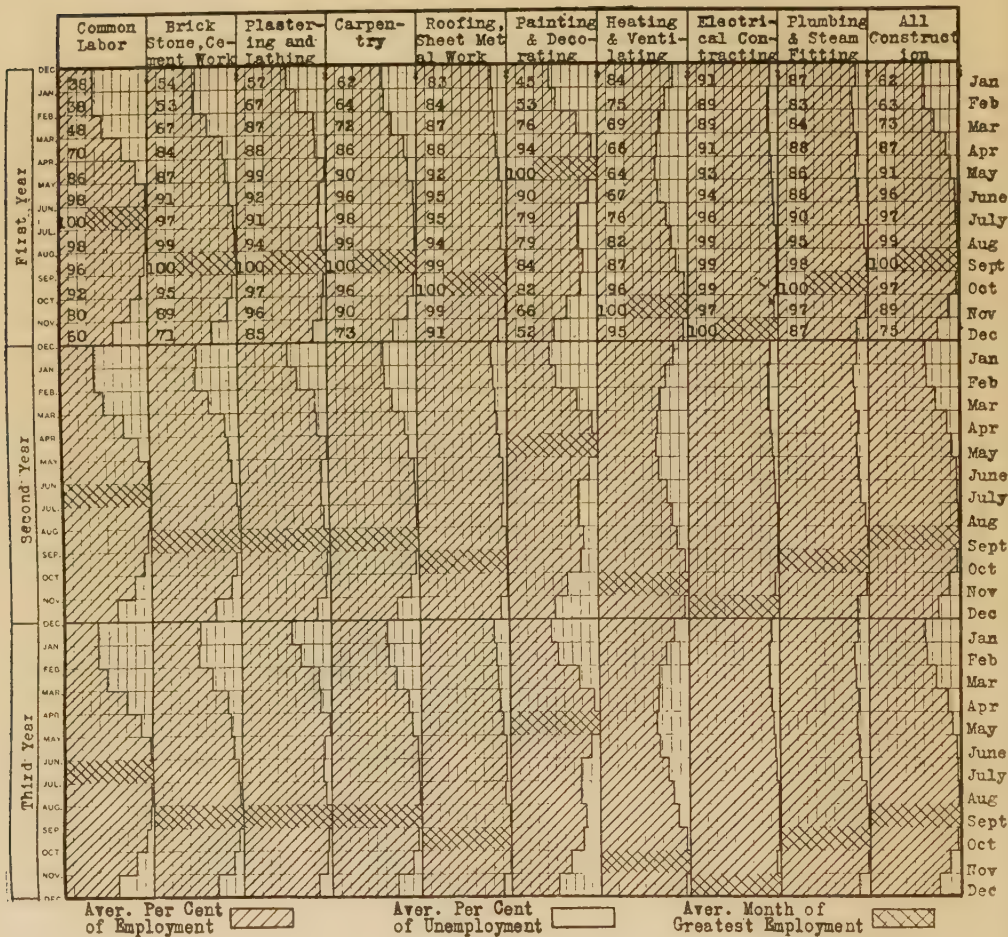


CHART CVI
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, LUCAS COUNTY, OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF LABOR STATISTICS, STATE OF OHIO

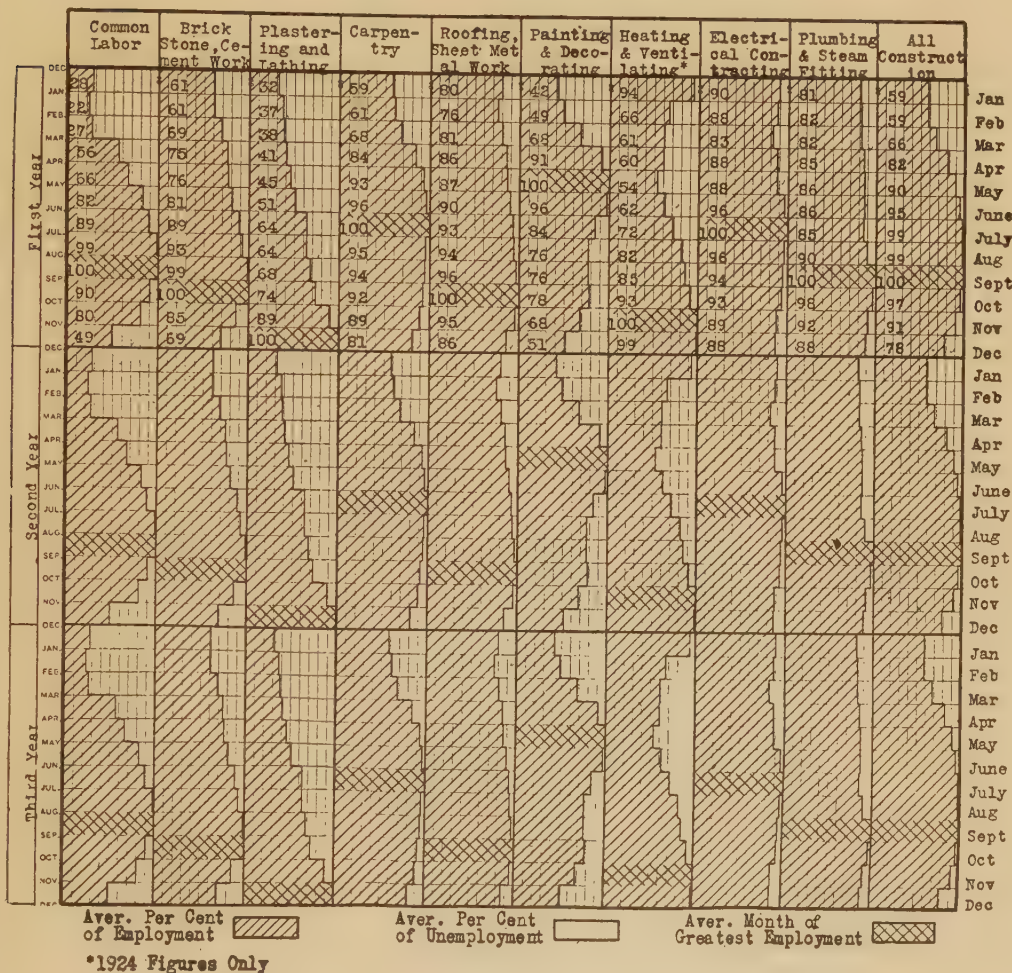


CHART CVII
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, MAHONING COUNTY, OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF LABOR STATISTICS, STATE OF OHIO

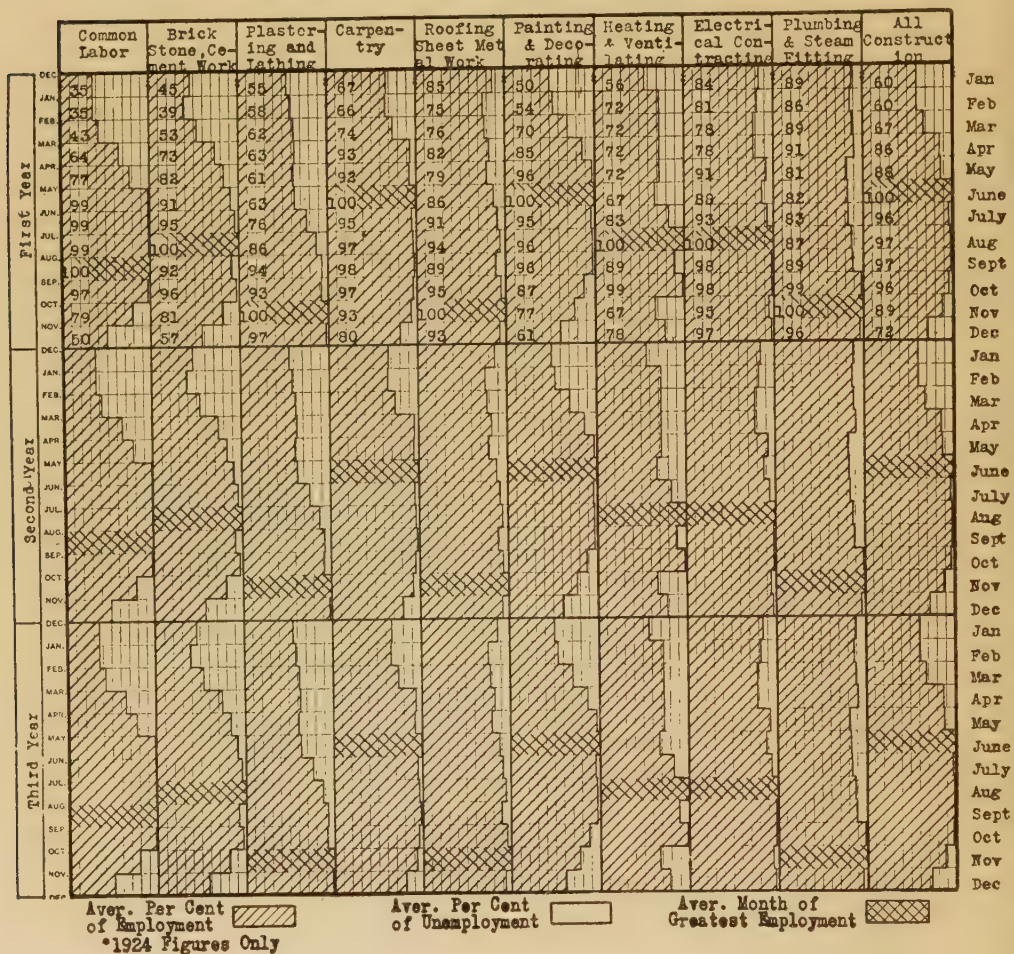


CHART CVIII

SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, MONTGOMERY COUNTY, OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM DIVISION OF LABOR STATISTICS, STATE OF OHIO

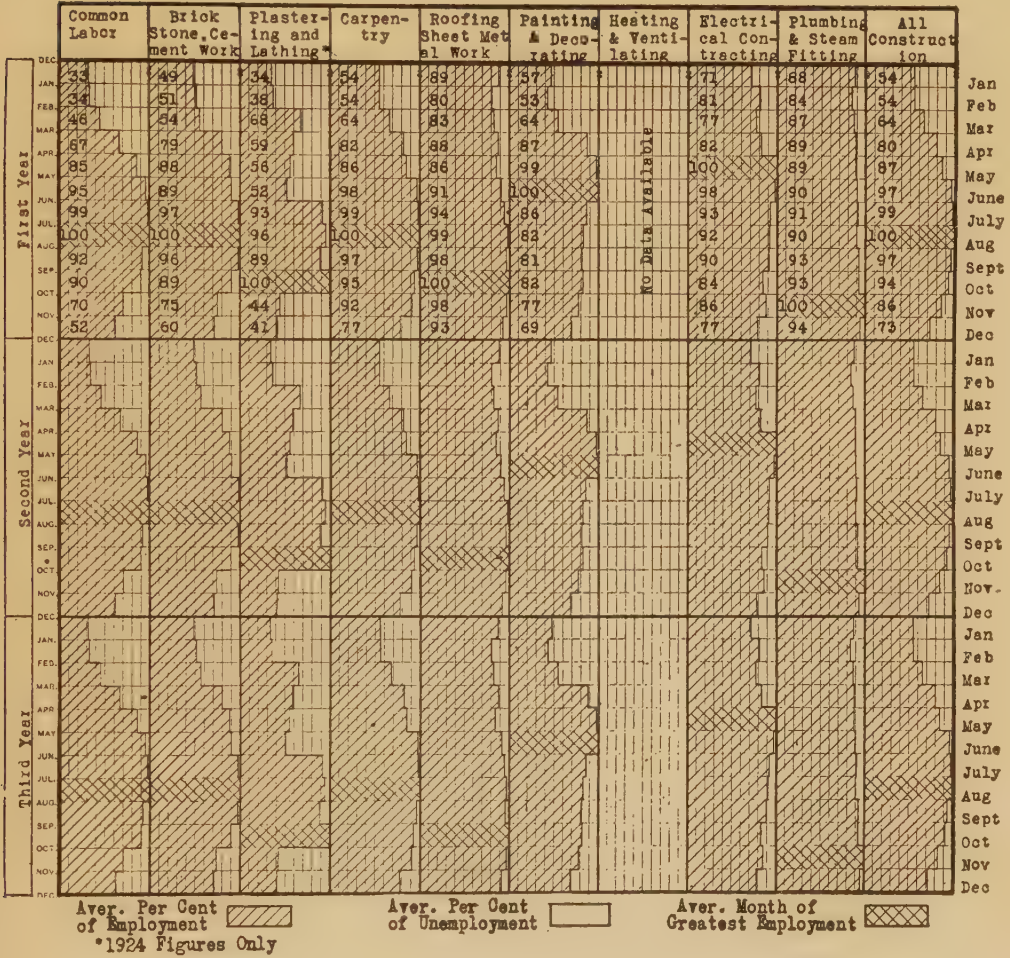
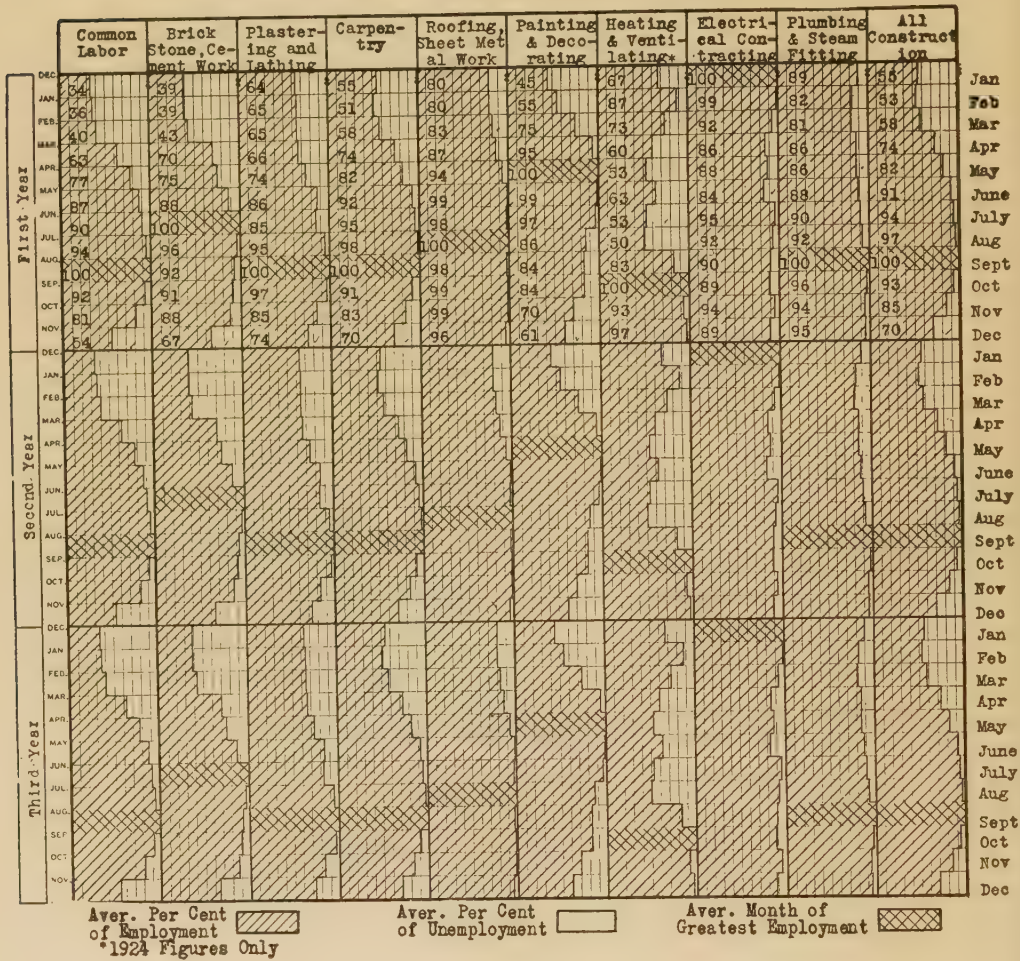


CHART CIX
SEASONAL VARIATION IN EMPLOYMENT IN THE CONSTRUCTION INDUSTRY BY GROUPS, SUMMIT COUNTY, OHIO, SHOWING CONTINUOUS MONTHS OF AVAILABLE LABOR SUPPLY—FROM
DIVISION OF LABOR STATISTICS, STATE OF OHIO



the available labor supply. Similar charts (CII to CIX) are shown for the principal counties.

When Should a Project be Commenced?

The available labor supply in most cases is the most important factor in planning operations. The planning chart is for use in those cases in which the owner or contractor wishes to plan his building activity so as to take advantage of the seasons of under-employment in the building industry. In such cases, when should a project be commenced? In order to answer this question it is necessary to know the approximate time each craft will be required and the sequence of their operations. Then the builder may experiment with the planning chart for different times for beginning operations, by laying out on the chart lines which would indicate the months during which each craft would be occupied on the job. In this manner the builder could determine the relative merits of the different times for each of his projects and decide on the most expedient one. Universal planning of this sort would have the effect of smoothing out the seasonal curve and affording continuous employment to contractors and wage earners alike.

The Responsibility

The building industry itself is convinced of the practicability of winter construction. Both employers and employees desire continuous work rather than alternate seasonal rush periods and dull periods. Governmental and civic agencies are striving to regularize employment.

Then why does the seasonal curve of employment in the building industry remain one of a pronounced warm weather peak and of an equally pronounced cold weather trough? Primarily because the building public is not convinced of the desirability of winter construction. In the last analysis, it is the public which builds and repairs structures which must decide when such work is to be done. Construction firms operate on a contract basis and the owner's wishes are paramount. While the ultimate responsibility rests with the public, the immediate responsibility rests with the building industry. The executives of the building industry constitute the only managerial group directly affected by this problem. The question as to continuous or seasonally fluctuating activity is a managerial problem and the solution of the problem must

be initiated by the executives of the building industry. It is this group which must bring to the notice of the building public the advantages of winter construction to the end that seasonal irregularity may be reduced to a minimum.

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APPENDIX

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TABLE A
ALL CONSTRUCTION WORK, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	2,004	21,447	19,358	22,008	29,538	33,823	37,701	38,447	39,232	39,855	36,784	31,340	22,030
1915	3,219	23,695	22,668	28,172	37,814	44,135	46,441	50,395	51,453	54,470	53,323	50,586	41,656
1916	3,963	36,954	37,347	37,657	50,205	58,106	64,922	69,871	74,678	75,120	73,940	69,904	59,132
1917	4,372	47,926	46,349	52,528	60,490	73,432	78,020	78,996	81,948	80,580	77,323	72,296	52,973
1918	4,273	41,208	41,316	48,757	57,848	59,641	68,249	69,860	69,506	63,288	62,515	55,509	49,524
1919	4,747	35,160	33,652	35,617	43,734	47,305	55,406	59,609	65,411	68,093	69,418	67,541	61,121
1920	5,382	51,516	50,566	58,029	67,186	72,277	76,351	75,657	78,687	82,340	75,469	66,894	55,726
1921	4,890	39,711	36,134	39,025	44,881	41,685	52,082	55,219	55,864	57,956	55,797	48,524	42,055
1922	5,005	29,792	29,537	29,758	36,454	48,003	57,375	62,356	67,352	66,940	66,940	63,232	53,723
1923	5,883	45,315	42,792	48,568	57,651	66,158	74,796	78,067	81,684	77,895	75,305	71,214	61,483
1924	7,364	49,488	48,719	52,975	66,470	72,322	78,169	85,084	85,301	83,601	82,327	73,535	60,071

TABLE B
BRICK, STONE AND CEMENT WORK, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	266	2,431	1,763	2,203	3,208	3,750	3,944	4,061	4,241	4,144	3,768	3,412	2,250
1915	337	1,545	1,420	2,043	2,725	3,014	3,241	3,272	3,555	4,209	3,673	3,357	2,493
1916	404	2,153	2,286	2,338	3,583	4,252	4,847	5,444	5,214	5,889	5,448	5,320	4,483
1917	468	3,523	3,354	3,746	4,651	5,893	5,978	6,438	6,956	7,022	6,374	5,750	3,547
1918	421	1,578	1,799	2,682	3,137	3,126	3,463	4,435	4,664	4,062	4,413	3,774	2,961
1919	441	1,772	1,654	1,775	2,372	2,578	3,263	4,164	4,488	4,350	4,413	3,936	3,522
1920	513	2,918	2,994	3,691	4,576	4,648	5,025	5,353	5,372	4,507	5,101	4,407	3,668
1921	480	2,809	2,107	2,925	3,257	3,173	3,675	4,046	3,855	4,164	4,020	3,450	3,050
1922	507	2,002	2,286	2,623	2,387	3,953	5,002	5,168	5,634	5,634	5,602	5,076	4,298
1923	558	3,328	2,986	3,779	2,976	5,249	5,860	6,520	6,406	6,406	6,156	5,899	5,130
1924	733	3,991	3,848	4,512	5,894	6,521	7,014	7,364	7,372	7,173	7,098	6,191	5,036

TABLE C
ELECTRICAL CONTRACTING WORK, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	70	730	694	660	715	714	833	897	888	992	862	784	715
1915	86	746	718	715	747	775	736	761	822	833	875	889	876
1916	126	928	941	974	1,122	1,270	1,362	1,478	1,558	1,542	1,437	1,474	1,514
1917	156	1,759	1,830	1,879	1,627	1,897	1,981	2,061	2,168	2,032	1,945	2,023	1,943
1918	169	1,983	2,036	2,076	2,080	1,990	1,956	1,976	1,980	1,935	1,910	1,855	2,021
1919	186	2,000	1,925	1,868	1,820	1,768	2,009	2,017	2,013	2,045	2,159	2,204	2,258
1920	224	2,411	2,400	2,444	2,586	2,480	2,590	2,614	2,507	2,403	2,405	2,259	2,260
1921	202	1,972	1,888	1,810	1,699	1,132	1,508	1,730	1,644	1,729	1,745	1,683	1,588
1922	228	1,483	1,349	1,176	1,427	1,435	1,461	1,627	1,641	1,731	1,789	1,860	1,936
1923	219	2,098	2,162	2,152	2,300	2,551	2,802	2,881	3,035	3,167	2,973	2,963	2,929
1924	294	3,125	3,032	2,962	2,957	2,905	2,840	2,812	2,860	2,802	2,795	2,749	2,683

TABLE D
GENERAL CONTRACTING, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	682	8,442	7,572	8,729	12,062	13,408	14,964	15,533	15,956	16,362	15,427	12,880	8,667
1915	1,231	10,227	9,857	13,082	17,717	21,140	22,741	24,806	24,242	25,706	25,159	25,224	21,815
1916	1,502	19,786	20,267	19,248	26,582	30,625	33,327	36,591	39,142	38,680	39,279	37,483	32,676
1917	1,599	26,371	25,160	28,452	31,734	37,862	38,378	40,246	40,584	39,198	38,482	36,456	26,160
1918	1,462	19,959	19,221	21,767	25,289	24,507	29,350	32,932	32,872	29,362	29,993	26,349	22,226
1919	1,808	16,012	15,088	15,917	20,530	21,937	26,616	28,147	31,715	36,512	36,006	36,325	34,436
1920	1,970	28,329	27,491	32,329	36,420	38,033	39,168	40,397	39,232	43,072	36,334	31,735	26,991
1921	1,731	18,203	16,018	17,104	19,378	15,922	20,483	21,980	21,259	22,411	21,645	19,599	18,474
1922	1,798	12,509	12,304	12,304	15,684	20,524	24,902	26,750	28,203	28,545	29,348	28,233	24,931
1923	2,185	20,004	18,863	21,967	25,468	28,224	31,046	37,903	32,513	30,851	29,193	28,129	25,652
1924	2,771	21,356	21,284	23,456	29,223	30,388	32,720	36,623	34,938	33,136	32,403	29,635	25,743

TABLE E
PAINTING AND DECORATING, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	140	969	943	1,233	1,645	1,945	1,804	1,420	1,366	1,388	1,360	1,232	971
1915	218	832	887	1,255	1,852	2,171	1,907	1,605	1,493	1,558	1,569	1,286	1,046
1916	257	902	1,097	1,418	1,986	2,329	2,263	2,008	1,839	1,820	1,832	1,720	1,344
1917	279	1,097	1,234	1,642	1,948	2,346	2,276	2,055	1,954	1,964	1,871	1,636	1,152
1918	274	902	1,050	1,649	1,930	2,095	2,205	1,766	1,633	1,581	1,552	1,272	1,083
1919	287	932	1,131	1,466	1,797	1,995	2,135	2,102	2,043	2,133	2,041	1,767	1,497
1920	365	1,419	1,603	1,959	1,956	2,422	2,598	2,480	2,353	2,278	2,151	1,845	1,527
1921	311	1,173	1,260	1,688	1,847	1,457	1,705	1,587	1,633	1,704	1,750	1,418	1,257
1922	325	1,039	1,154	1,370	1,812	2,421	2,463	2,215	2,161	2,175	1,986	1,813	1,508
1923	490	1,582	1,780	2,257	2,839	3,206	3,313	3,015	2,978	2,893	2,734	2,551	2,175
1924	688	1,682	1,865	2,366	3,221	3,684	3,642	3,346	3,173	3,112	2,881	2,527	1,978

TABLE F
PLASTERING, INCLUDING LATHING, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	34	269	268	351	480	515	497	516	437	424	459	446	305
1915	56	422	306	419	515	496	477	587	846	554	502	537	476
1916	64	624	658	534	662	719	789	765	770	744	782	762	702
1917	85	577	599	562	515	802	834	939	999	1,005	805	619	450
1918	78	387	569	948	1,410	1,635	1,987	2,352	2,631	2,934	516	454	391
1919	131	398	482	565	547	540	620	712	729	818	882	868	853
1920	158	892	864	982	998	899	1,060	1,239	1,281	1,282	1,323	1,256	1,185
1921	131	938	1,063	994	981	462	536	894	873	909	1,062	987	1,075
1922	130	753	701	603	595	750	864	1,069	1,127	1,120	1,182	1,181	1,181
1923	150	898	1,022	1,175	1,172	1,157	1,167	1,187	1,194	1,207	1,269	1,363	1,290
1924	205	1,349	1,386	1,354	1,360	1,449	1,543	1,626	1,703	1,623	1,597	1,505	1,346

TABLE G
PLUMBING AND STEAM FITTING, STATE OF OHIO
 Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	216	2,047	1,940	1,995	2,142	2,214	2,193	2,239	2,326	2,397	2,382	2,304	2,132
1915	282	2,412	2,222	2,419	2,584	2,680	2,798	2,712	2,883	2,999	3,132	3,010	2,927
1916	351	3,054	3,039	3,021	3,227	3,266	3,334	3,507	3,581	3,620	3,659	3,742	3,548
1917	364	3,166	2,999	3,040	3,045	3,406	3,429	3,351	3,370	3,420	3,415	3,359	3,186
1918	369	2,889	2,696	2,796	2,784	2,712	2,612	2,745	2,687	2,781	3,062	2,945	2,945
1919	394	2,855	2,683	2,650	2,706	2,612	2,955	3,131	3,269	3,330	3,625	3,734	3,837
1920	440	3,763	3,654	3,663	3,722	3,360	3,179	3,308	3,316	3,879	4,061	3,926	3,619
1921	373	3,018	2,895	2,647	2,707	2,324	2,550	2,669	2,738	2,942	3,094	3,078	2,906
1922	371	2,618	2,404	2,114	2,272	2,710	2,880	3,135	3,277	3,391	3,543	3,435	3,725
1923	416	3,674	3,409	3,463	3,513	3,553	3,683	3,765	3,860	4,083	4,119	4,141	4,069
1924	523	4,214	4,069	3,943	4,127	4,009	4,077	4,282	4,406	4,644	4,709	4,659	4,463

TABLE H
SAND AND GRAVEL EXCAVATING, STATE OF OHIO
 Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	55	395	365	517	658	793	803	820	835	841	778	700	447
1915	80	541	576	673	879	949	983	976	1,002	1,016	1,037	967	767
1916	91	558	542	712	1,027	1,151	1,119	1,133	1,180	1,184	1,173	1,124	963
1917	100	682	642	868	1,056	1,195	1,225	1,266	1,304	1,258	1,153	1,047	754
1918	86	579	688	887	1,187	1,248	1,157	1,148	1,179	1,046	1,058	998	827
1919	73	556	699	699	824	888	934	903	973	974	946	875	679
1920	86	598	596	712	908	976	1,030	963	915	1,020	1,039	937	695
1921	72	406	404	451	516	539	602	662	746	790	724	700	584
1922	79	461	494	592	686	743	865	896	989	870	807	760	610
1923	91	593	612	704	847	980	1,131	1,100	1,111	1,102	993	923	734
1924	117	757	819	959	1,215	1,163	1,212	1,237	1,275	1,327	1,300	1,165	857

TABLE I
SHEET METAL WORK AND ROOFING, STATE OF OHIO
 Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	151	1,172	1,044	1,144	1,303	1,415	1,569	1,566	1,500	1,544	1,580	1,520	1,227
1915	226	1,647	1,543	1,592	1,887	1,753	1,890	2,042	2,101	2,184	2,260	2,225	2,158
1916	256	1,942	1,807	1,777	2,021	2,137	2,162	2,222	2,274	2,227	2,215	2,444	2,269
1917	300	2,167	2,142	2,204	2,074	2,372	2,647	2,541	2,619	2,613	2,589	2,656	2,191
1918	307	1,941	2,059	2,244	2,268	2,130	2,201	2,144	2,129	2,145	2,177	2,139	2,122
1919	306	1,791	1,558	1,583	1,825	1,926	2,012	2,012	2,269	2,338	2,507	2,504	2,423
1920	338	2,169	2,247	2,347	2,516	2,788	2,714	2,879	2,763	2,781	2,824	2,787	2,499
1921	294	1,982	1,719	1,764	1,868	1,504	1,782	1,838	1,850	1,929	2,040	2,096	2,112
1922	282	1,676	1,531	1,328	1,588	1,813	1,915	1,985	2,177	2,136	2,263	2,408	2,313
1923	306	2,242	2,127	2,174	2,162	2,359	2,393	2,469	2,495	2,539	2,735	2,753	2,587
1924	353	2,398	2,133	2,201	2,357	2,350	2,370	2,629	2,667	2,703	2,835	2,740	2,615

TABLE J
STREET, ROAD, AND SEWER CONTRACTING WORK, STATE OF OHIO
 Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
 Source: Ohio Division of Labor Statistics

Year	Number of Establishments Reporting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	233	1,994	1,965	2,311	4,273	5,957	7,585	7,925	8,247	8,513	7,008	5,027	2,501
1915	391	1,782	1,797	2,716	5,777	7,781	8,016	9,384	10,054	10,695	10,040	8,330	4,185
1916	506	3,087	2,940	3,257	6,043	8,212	10,631	12,340	14,625	15,024	13,533	11,172	7,077
1917	570	4,393	4,260	5,894	9,436	12,800	14,181	14,822	16,489	16,619	15,251	13,329	8,782
1918	603	6,631	6,826	9,203	13,033	15,417	18,557	15,738	14,554	12,701	12,898	10,825	9,949
1919	556	4,562	4,445	5,062	7,197	8,781	10,309	11,637	13,026	12,661	11,755	9,844	6,503
1920	625	3,956	3,821	4,816	8,122	11,030	13,047	14,219	15,196	14,438	14,297	11,753	7,530
1921	663	4,210	4,015	5,094	8,290	10,907	14,802	15,906	17,049	17,261	15,596	11,333	6,942
1922	705	3,940	3,388	3,980	6,301	9,611	12,753	15,160	17,941	16,527	15,812	13,830	8,768
1923	795	5,328	4,390	5,567	9,054	12,770	16,771	18,923	21,237	18,921	18,582	15,969	10,732
1924	906	6,024	5,546	6,318	11,266	14,408	17,491	19,826	21,445	21,561	21,218	17,124	10,298

TABLE K
VENTILATING AND HEATING, STATE OF OHIO
Fluctuations in Number of Wage Earners Employed on the 15th of Each Month
Source: Ohio Division of Labor Statistics

Year	Number of Establish- ments Re- porting	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914	18	298	285	270	284	268	316	334	367	369	364	391	378
1915	22	296	261	247	253	253	248	285	318	320	332	395	407
1916	28	383	414	428	362	361	396	485	466	473	500	554	511
1917	30	482	469	487	532	635	596	534	504	499	542	575	499
1918	40	513	446	358	343	323	325	324	366	405	460	491	577
1919	29	318	271	212	206	146	165	205	296	337	365	391	372
1920	58	513	434	405	413	456	468	528	406	552	652	668	583
1921	58	533	456	424	335	255	326	351	411	489	514	467	438
1922	45	231	207	141	167	238	267	268	328	350	326	351	344
1923	70	587	532	522	548	602	669	697	765	795	809	826	768
1924	69	602	533	544	502	488	533	549	572	612	672	656	630

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